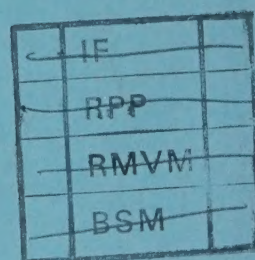
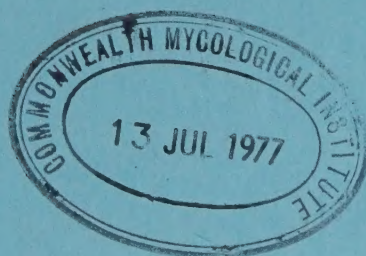


ANNUAL REPORT

department of
agricultural technical services



1 july 1975 to 30 june 1976



REPUBLIC OF SOUTH AFRICA

ANNUAL REPORT

of the

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for the period
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**Report of the Secretary for Agricultural
Technical Services for the period
1st July, 1975, to 30th June, 1976**

THE HONOURABLE THE MINISTER OF AGRICULTURE,
PRETORIA

SIR,

I have the honour to submit herewith the Annual Report of the Department.

W.A. VERBEEK
Secretary for Agricultural Technical Services

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1. Introduction

REGULATORY AND RELATED SERVICES PROVIDED BY THE DEPARTMENT

The importance of the agricultural industry to the national economy of the Republic of South Africa has come prominently to the fore during the past few years and will increase in years to come. On the one hand, agricultural development must at all times be seen against the background of limited resources and their vulnerability, and on the other, the demands made of the industry to supply the food requirements of a rapidly growing population with a steadily rising standard of living.

The Department of Agricultural Technical Services has the task of promoting agricultural development in the widest sense, in accordance with the principle of optimal land use. To plan and implement optimal land use effectively, this Department has an organisation in which provision is made for *research and extension services* and *other specific services*, as well as *administration*. Special attention will be given to *services* in this year's introductory chapter.

The provision of certain control and related services, particularly for the protection of the agricultural industry, is part and parcel of the functions of departments of agriculture all over the world. From the time of Union to 1958, when the Department of Agriculture was split into two departments, the number of Acts relating to agriculture rose to 49. At present the Department of Agricultural Technical Services alone has to administer 24 Acts. While this legislation was initially related more directly to the protection of animals and plants against diseases and pests, control was in due course extended to other matters, e.g. soil conservation, vegetation and water resources, as well as to the sale of fertilisers, stock feed and agricultural aids, in order to protect the farming community against possible exploitation. Other control measures relate to artificial insemination, seed production and the cleaning and sale of seed, while statutory provision has also been made for plant breeders' rights. There is thus a great variety of measures that have been instituted for statutory control over various aspects of the agricultural industry.

Within the Department of Agricultural Technical Services, with its vigorous and extensive research and extension services, this facet of the

service it renders is in many respects perhaps not so well-known or striking. The Department's regulatory and control services nevertheless play a very important part. During the year under review the Department spent about 37 per cent or R22,8 million of its budget on this important function.

Several of the Department's divisions, institutes, and regional organisations are involved in this service in one way or another. The following may be mentioned:

PLANT AND SEED IMPROVEMENT SERVICES

Because of the limited area of land available for crop cultivation in South Africa - an area on which an increasing quantity of food and other products will have to be raised in future - the availability of top quality plant material, and this includes seed, will become all the more important.

It is well-known that the use of plant material of high quality is one of the best ways of increasing agricultural production per unit of area, as well as of improving the quality of the products. The Department therefore has the responsibility of ensuring that sufficient plant material of the desired quality is made available.

South Africa has the most comprehensive and most modern plant and seed control services on the African continent and liaises with all the most important international organisations concerned with plant propagation material. The Division of Plant and Seed Control is responsible for the administration of services and performs these functions in terms of the Plant Improvement Act, 1976 (Act 53 of 1976), the Plant Breeders' Rights Act, 1976 (Act 15 of 1976), and the Agricultural Pests Act, 1976 (Act 3 of 1973).

By trying to prevent harmful plant pests and diseases from being introduced into the country or from spreading locally, or to eradicate such pests and diseases, crops are protected against possible damage or even destruction, and production is promoted.

Variety trueness and the physical and phytosanitary quality of plants and seed intended for marketing in South Africa are ensured by means of control in the trade, certification schemes, and control over the quality of imported plant material. Plant breeding in the Republic is promoted by providing facilities for plant breeders' rights to be obtained for new cultivars. Since reciprocal agreements in this connection are being concluded with other countries and are still to be

concluded, the introduction of first-rate overseas cultivars into South Africa is encouraged. Phytosanitary, certification and testing services conforming to international standards make facilities available to the local as well as to the overseas trade, through which local cultivation and the export of plant material are made possible and can be promoted.

PLANT PROTECTION SERVICES

After 1945 a host of pesticides and other preparations appeared on the South African market and it became an urgent necessity to introduce legislation to protect the farming community against possible exploitation by chemical companies. The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947) was passed and regulations relating to agricultural remedies came into force in 1951. The Plant Protection Research Institute administers this Act. In terms of this legislation, no pesticide may be marketed unless it is registered with the Department. The manufacturers concerned are expected to submit experimental data on the toxicology and efficacy of the preparation when applying for registration. If the preparation is manufactured for use on edible crops the applicant also has to submit data, collected from time to time after application, on the chemical residues.

These data enable the researchers to determine the waiting periods between application and harvesting and to eliminate the danger of toxic residues being ingested by the consumer. In terms of a recent amendment (Act 60 of 1970), a pesticide may be registered only if it does not conflict with public interest. All applications for registration are carefully studied by a permanent inter-departmental advisory committee for the protection of humans against toxic substances before the products are allowed on the market. This committee consists of representatives of the Department of Health and the Department of Agricultural Technical Services.

Even though supervision over the use of pesticides in the agricultural industry today is really still minimal, it is encouraging that the level of chemical residues in food, as determined directly in food, or indirectly, as well as in the environment, is not nearly as high as in some countries where the agricultural industry has reached an equally high level of development.

Act 36 of 1947 and the regulations made in terms of this Act make ample provision for inspection and quality control of registered products. A measure of control is also exercised in respect of fertilisers and stock feeds.

As far as regulatory aspects are concerned, the Plant Protection Research Institute's Phytosanitary Services Subdivision deals with the Agricultural Pests Act, 1973 (Act 3 of 1973), the Plant Improvement Act, 1976 (Act 53 of 1976) and the International Plant Protection Convention. The activities of the Department are at present centred on basic as well as applied research on pests or diseases occurring in imported plant material, and

the provision of such material in a hygienic condition, so that it poses no phytosanitary risk to established crops in South Africa. Services are likewise provided for local plant propagation material which may be contaminated by pests or diseases and may have a harmful effect on the economic productivity or life of the plant or crop.

OTHER PLANT SERVICES

The Department's Botanical Research Institute supplies general information, names plants and provides expert services in the field of botany. The National Herbarium and the four regional herbaria are involved in 25 000 plant names annually, and so also provide an information service. The plant-collecting team, which supplies the United States Department of Agriculture and many other overseas research institutions, with material on a large scale, performs a service which is in South Africa's national interest, since the data from ecological surveys are used for purposes of planning. In view of the environmental crisis and the strong emphasis on environmental planning at present, the extension of these botanical information services is of the greatest importance to the Republic and also fulfils an urgent need in the homelands.

The Fruit and Fruit Technology Research Institute has, during the past 15 years, made leaf analyses of selected orchards and established norms for the leaf composition of various kinds of fruit. The producers involved were able to use the results, but because of a lack of manpower and funds it has not yet been possible to offer a routine leaf analysis service.

Because of the tremendous growth of the viticultural industry in South Africa, there has been a great demand for plant material, and, as there was virtually no control over the quality of vine propagation, material of poor quality from a viticultural and a phytosanitary point of view, was used in the industry. The standard of a large part of our vineyards is weak compared with many overseas countries, where the quality of propagation material has long since received attention.

The Oenological and Viticultural Research Institute at Stellenbosch has initiated a scheme for the handling of vine propagation material and drawing up of standards for such material, in co-operation with all the organisations concerned, e.g. the KWV and the SA Nurserymen's Association. The purpose of this service is the systematic supply to the industry of the best material, from both a viticultural and a phytosanitary point of view. The aim is that within the next 10 to 12 years no vine propagation material other than super grade will be produced or traded in.

Liquor control was instituted in 1944 as a result of the establishment of quality control over export beverages, in accordance with liquor export regulations. The Oenological and Viticultural Research Institute at present provides this

regulatory service and is gradually taking over the administration of Act 35 of 1957 because of the highly technical nature of the requirements of this Act. This embraces control over compliance with the requirements of the Act with regard to methods of preparation, further processing and treatment, and chemical composition and quality of the final product. This service is important because it has to do with upholding and further promoting the high esteem already enjoyed by South Africa's system of origin at international level, largely because of its soundness and validity from a scientific and technical point of view, which is the result of its direct liaison with this Department.

ANIMAL PRODUCTION SERVICES

The Department's Animal and Dairy Science Research Institute is concerned with four Acts relating to animal production:

Registration of Pedigree Livestock Act, 1957 (Act 28 of 1957)

This Act provides for a statutory body, the South African Stud Book Association, which administers the issuing of pedigree registration certificates and in practice functions as the responsible body on behalf of the stud industry. The Director of the Institute acts as the personal representative of the Minister to ensure that the provisions of the Act are complied with, that is to say, that requirements relating to the certificates of incorporation of the Association itself, of the Karakul Breeders' Association (an autonomous body under the Act), and of the approximately 30 stock breeders' associations affiliated to the SA Stud Book Association. In addition the Institute handles all technical advice and liaison services under the Act.

Artificial Insemination of Animals Act, 1954 (Act 23 of 1954)

This Act makes provision for a statutory body, the Artificial Insemination Board, which attends to all matters relating to the orderly application of artificial insemination of farm stock in the country. The Director of the Institute is appointed Chairman of the Board by the Minister. Because of the highly technical nature of the Act, the Registrar is dependent on the regular professional advice, judgement and recommendations of the Institute.

Livestock Improvement Act, 1963 (Act 74 of 1963)

This Act provides for various aspects of livestock improvement in the country. Through the years, the greater part of the Act fell into disuse as or result of various new technical developments. The sections relating to the importation of animals are, however, still valid and entail a considerable amount of work and responsibility, particularly where technical advice, correspondence and recommendations on applications for import

permits, etc., are concerned. The value of imports in 1975 was estimated at about R11 million.

Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947)

This Act provides for a number of matters affecting fertilisers, farms feeds, agricultural remedies and stock remedies as well as sterilisation installations. The aspects of the Act relating to feeds fall under a technical adviser at the Institute, aided by an assistant and a technical committee of that establishment. The application of the technical aspects of the Act is an important function, since the feed industry is a large one with an annual turnover exceeding R200 million.

OTHER LIVESTOCK SERVICES

Livestock Improvement Schemes: The Animal and Dairy Science Research Institute is responsible for the organisation and technical administration of the following schemes:

- (a) The National Milk Recording and Progeny Testing Scheme
- (b) The National Beef Cattle Performance and Progeny Testing Scheme
- (c) The National Pig Performance and Progeny Testing Scheme
- (d) The National Woolled Sheep Performance and Progeny Testing Scheme
- (e) The National Mutton Sheep Performance and Progeny Testing Scheme
- (f) The Random Sample Egg Production and Poultry Meat Production Testing Scheme.

Wool Fleece Testing Service: The Institute's Wool Fleece Testing Centre undertakes the testing of wool samples for producers and supplies farmers with details of the most important quality characteristics.

Blood-typing Service: The Institute's immunogenetic laboratory provides a routine service for the stud industry with a view to pedigree certification and control, as required in terms of Act 28 of 1957. Determination of the zygosity of twins and identification of freemartins are also undertaken.

Quality Improvement Service for Dairy Products: Following requests from the industry, the Department directed that an objective analysis and quality-evaluating service for dairy products be set up by the Institute. With the aid of accepted and developed techniques, the quality of products can be determined and their keeping quality under prescribed storage conditions predicted. This service forms an integrated and supplementary aid in the Institute's specialised dairy technological extension to factories.

VETERINARY SERVICES

The administration of the Animal Diseases and Parasites Act, 1956 (Act 13 of 1956) remains one of the main functions of the Division of Veterinary Services. This entails preventing diseases

from being introduced into, and the eradication of diseases in, the country.

A further function is the administration of the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967), in terms of which control is exercised over all abattoirs and direct meat inspections are carried out and hygiene is controlled at 21 of the larger abattoirs, where almost 50 per cent of all red meat is slaughtered for local consumption.

Diagnostic services are offered at four regional laboratories and a number of smaller ones, personnel and farmers are trained, and veterinary extension services are offered.

This Division therefore plays a major part in enabling the Department to attain its objective of optimal utilisation through efforts to raise reproduction and combat losses.

In addition to the primary research function, the Veterinary Research Institute provides three supportive services, namely:

1. A specialised diagnostic service, which is essential to back up stock disease control by the Division of Veterinary Services and to ensure meaningful extension and action. This service extends to neighbouring states and other countries, and in this respect the Institute has been nominated World Reference Centre for horsesickness and bluetongue in sheep.

Although laboratory diagnostics are unpredictable and absorb a good 40 per cent of the time and funds available for planned research, the service is an essential one which must continue to answer to the Department's wide aims and to keep the Department in touch with the problems of disease in the livestock industry.

2. The provision of diagnostic aids and preventive vaccines: The former are essential to enable the Division to apply disease control and execute health schemes, e.g. the elimination of tuberculosis and brucellosis.

The preparation of preventive vaccines is a service which, traditionally, resulted from the research done on contagious stock diseases. From small beginnings, this grew to a tremendous undertaking which, in the year 1975/76 had to cope with a demand of nearly 171 million doses of 42 different vaccines. This service places the South African stock farmer in a privileged position because these vaccines, supplied at virtually cost price and regarded as the cheapest in the world, are not fully available from commercial sources overseas. About 10 per cent of the total vaccine production is at present exported to neighbouring states and other countries and is an important contribution to the economic agricultural development of our neighbouring states and the homelands.

There is no doubt that this service has been of inestimable value to the stock industry in South Africa and will have to be continued and expanded in future to maintain the health of livestock at a high level.

3. The Institute also provides an advisory service in respect of the Fertilizers, Farm Feeds,

Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947). Officers of the Institute act as technical advisers to the Registration Officer to ensure that stock remedies, such as pesticides for use on animals, dips, worm remedies and other remedies presented for registration conform to a certain standard of safety and efficacy.

REGULATORY AND GENERAL SERVICES IN LAND AND WATER AFFAIRS

The Department undertakes, among other things, the following regulatory and general services which directly or indirectly involve the Soil and Irrigation Research Institute:

Soil, plant and water samples are routinely analysed by the seven regions and four industry institutes (the Fruit and Fruit Technology Research Institute, the Oenological and Viticultural Research Institute, the Citrus and Subtropical Fruit Research Institute and the Tobacco Research Institute) for the benefit of farmers, with a view to providing advice on fertilising and the agricultural use of water for irrigation and stock watering purposes. The Institute does not provide farmers with a direct analysis service, but acts as the national co-ordinator in respect of analyses made for purposes of fertilisation.

At present about R240 million is spent on fertilisers in the Republic every year. These fertilisers are used on the advice given by private and Departmental bodies exclusively on the basis of soil and plant analyses. Therefore, the importance of this service, particularly as an extension aid, cannot be over-emphasised. The number of soil samples received by the Department from farmers has also shown a great increase - from 6 900 in 1970 to 11 000 in 1975. The number of plant samples increased from 600 in 1970 to 15 900 in 1975. During the 1974/75 financial year the Department published 12 bulletins, seven pamphlets and three technical communications and scientific publications dealing with fertiliser advisory services.

The Soil and Irrigation Research Institute carries out an inspection and an analysis service with a view to quality control in fertilisers, feeds, agricultural and stock remedies (Act 36 of 1947). It also acts as adviser to the Registration Officer where the registration of fertilisers is concerned, while various other institutes act as advisers on feeds and agricultural and stock remedies. In the pursuit of quality control, 1 182 samples were analysed in 1975 and 1 277 in 1976.

The Department, and specifically the Soil and Irrigation Research Institute, advises the Department of Water Affairs on the disposal of waste water (sewage and industrial and other effluents) for irrigation, with a view to the granting of water disposal permits to municipalities and industries (Act 54 of 1956 Water Act). This includes advice on the suitability of land for such purposes and the drafting of instructions and conditions according to which such water may be used for irrigation.

Other auxiliary services

Although the Department in the past (since 1925) provided specific soil survey services with regard to irrigation at the request of the Department of Water Affairs (formerly the Department of Irrigation) and the then Department of Lands, the emphasis gradually shifted from a purely service function to the situation as it is today, where these activities form an integral part of our research and planning actions. The only exception is soil surveys for court proceedings relating to the expropriation of land and a number of other *ad hoc* requests for soil surveys which occur from time to time and are still provided as a service.

SOIL PROTECTION SERVICES

The services provided by the Division of Soil Protection are closely connected with the application of two of the most important agricultural Acts, namely the Soil Conservation Act, 1969 (Act 76 of 1969), as amended, and the Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970), as amended.

The performance of the regulatory functions under the Soil Conservation Act results in direct intervention in the conservation of soil, since action is taken against those misusing it by means of restrictive directions, and where necessary, prosecution, in terms of the penalty clauses of the Act.

On the other hand, the Division also administers the financial assistance schemes in terms of the act, which schemes make funds available to farmers in order to attain the objects of the Act.

The administration of the Subdivision of Agricultural Land Act aims at the exercising of control over the injudicious division of agricultural land, which in practice results in non-viable units being created, this in turn resulting in the abuse of agricultural resources. Through this Act a large measure of control is also exercised over the use of agricultural land for other purposes, thereby ensuring that agricultural land is, as far as possible, retained for agricultural production.

In 1946 the planning, design and construction of State soil conservation works were started and about 300 of these have now been completed at a cost of R8,5 million. The Division of Agricultural Engineering, which is responsible for the construction of these works, at present controls the works in the catchment areas of the Upper Orange and Sand-Vet Rivers from a fully equipped office complex at Aliwal North.

AGRICULTURAL ENGINEERING SERVICES

The Division of Agricultural Engineering has standard specifications for glasshouses and growth cabinets recognised in this country as being completely suitable for the artificial environment-controlled conditions required from

time to time by various researchers, such as biologists, virologists, plant breeders and entomologists. The Division is responsible for the design and the specifications of the various glasshouses for the Department. At present 65 glasshouses and numerous other protective structures, valued at about R4 million, are in use.

Engineering services are also provided for the Grain Silo Committee of the Department of Agricultural Economics and Marketing. At present the total expenditure per annum amounts to about R19 million, while about 50 projects costing about R50 million are in progress throughout the country.

Other services provided by the Division of Agricultural Engineering are concerned with the erection of border fences, investigations into and the design of irrigation systems for experimental farms, the design of dairy complexes, and aid and advice to various statutory boards. The Division also advises the Director of Imports and Exports on the importation of tractors, and provides services to various bodies, such as those concerned with uniform roads ordinances dealing with large, heavy and wide agricultural implements, safety standards of agricultural implements, etc.

Engineering advice on the planning on mechanisation, the purchase of agricultural implements and the planning of facilities for animal production units in the homelands is also supplied in co-operation with the Department of Bantu Administration and Development. Regular services are provided for the Land Bank in the evaluation of the planning and specifications for milking machine systems, milk refrigeration equipment and the suitability of the dairy buildings to accommodate them, when farmers apply for hypothec loans.

In addition, recommendations are made in the case of loans made available by the Land Bank to Co-operatives for wine-cellarers. The Division is responsible for inspections of cold stores and for certifying them. Co-ordinating work in respect of all matters pertaining to tractors is done in close co-operation with private importers of tractors.

LIAISON WITH OTHER BODIES

These services developed through the years because some Departmental institutions, such as the Department's regional organisations, divisions and institutes, the private sector and even sister departments were seriously in need of assistance with certain specified tasks. In many respects it is only the Department of Agricultural Technical Services which, as an impartial organisation and the only one of its kind in the country, has the necessary experts and facilities to be able to provide these services.

The need for the services and their nature are continually evaluated in terms of the objects of the Department and are also continually evaluated by various bodies to ascertain whether these services are, in fact, fulfilling a need and producing the necessary practical results.

In providing these services, the Department liaises with, *inter alia*, the following bodies: The Department of Agricultural Economics and Marketing (in connection with controlled marketing, fresh produce markets, grading of products, co-operatives, grain silos, etc.); the Department of Agricultural Credit and Land Tenure (in connection with credit for a certain category of farmers, land tenure and control over State land); the Land Bank (in connection with loans to farmers); the Department of Planning and the Environment (in connection with the control of land use); the Department of Water Affairs (in connection with State irrigation schemes, irrigation board schemes and control over water allocations); the Department of Forestry (in connection with the control of afforestation and mountain catchment areas, sand-dune reclamation, fire control, etc.); the Department of Industries (in connection with the sugar and fishing industries, as well as the importation of tractors and agricultural machinery); the South African Bureau of Standards (in connection with the inspection of certain foodstuffs); the provinces (in connection with the institution and extension of areas of jurisdiction

involving agricultural land, the control of vermin and control of game and fish); the National Parks Board (in connection with nature conservation); and the Department of Bantu Administration and Department (in connection with agricultural research and advisory services in respect of the homelands).

CONCLUSION

The various services provided by the Department of Agricultural Technical Services are of major importance to agriculture as they contribute to the functions of the Department in the field of agricultural science. So far as the Republic is concerned, the services form a very important part of Departmental activities. Many of these services are concealed within the Department's other important functions, but are nevertheless of cardinal importance to the agricultural industry. Without them the Department would not be in a position to round off its widely divergent functions to the benefit of the industry.

2. Extension and Education

Agricultural extension and the allied technical and regulatory services are carried out by the eight regional organisations of the Department of Agricultural Technical Services.

With the rapid development of agricultural technology and the changes in the demand for certain agricultural products, ever-increasing demands are made of the extension officer in providing the farmer with scientifically based guidance.

The agricultural industry is a complex industry marked by new developments and seasonal trends which have to be taken into account by the extension officer all the time and which necessitate new extension methods to suit the changed agricultural situation.

NEW TRENDS

WINTER RAINFALL REGION

Extension methods

The prevailing economic climate and the resulting financial problems with which farmers have to contend have made farmers' need for economic information very pressing. The mail-in record study groups have played a greater part and farmers have shown a new interest in record-keeping, production cost determinations and the profitability of enterprises.

With the appointment of an agricultural economist at Ceres and a viticulturist at Worcester, with the sole task of providing specialist extension in viticulture at these centres, the extension needs of specialised farms in these extension wards can now be met to a large extent. There is a great need for more of these specialised extension officers, and particularly for specialised irrigation extension officers.

Liaison

A special effort was made in the Boland Subregion during the year under review to improve liaison with wine co-operatives and to canalise extension for viticulture through co-operative wineries. The managers and managements of 47 co-operative wineries were contacted with a view to obtaining co-operation in the creation of opportunities for extension such as group discussions, demonstrations - and especially for the essential follow-up work after guidance has been given to the members of a winery.

The co-operative wineries have also welcomed the idea of rationalising wine cultivars and have promised to co-operate wherever possible. It would seem that a new era has dawned in which winery managers will become deeply involved with extension to their members.

The respective representatives of service companies, co-operatives and research institutes and the extension officers of control boards have been constituted into four extension liaison committees. During the quarterly meetings the extension message is formulated so that it can be put across with greater uniformity. This liaison has already reduced confusion among producers to a large extent.

These bodies were also involved in ten mini farmers' days and played an active part in making a success of these occasions.

KAROO REGION

The abundance of grass for grazing has resulted in the farmers paying increasing attention to the -

- systematic control and combating of parasites and diseases;
- judicious introduction of a larger number of large stock;
- best possible use of licks for the more efficient utilisation of dry grass.

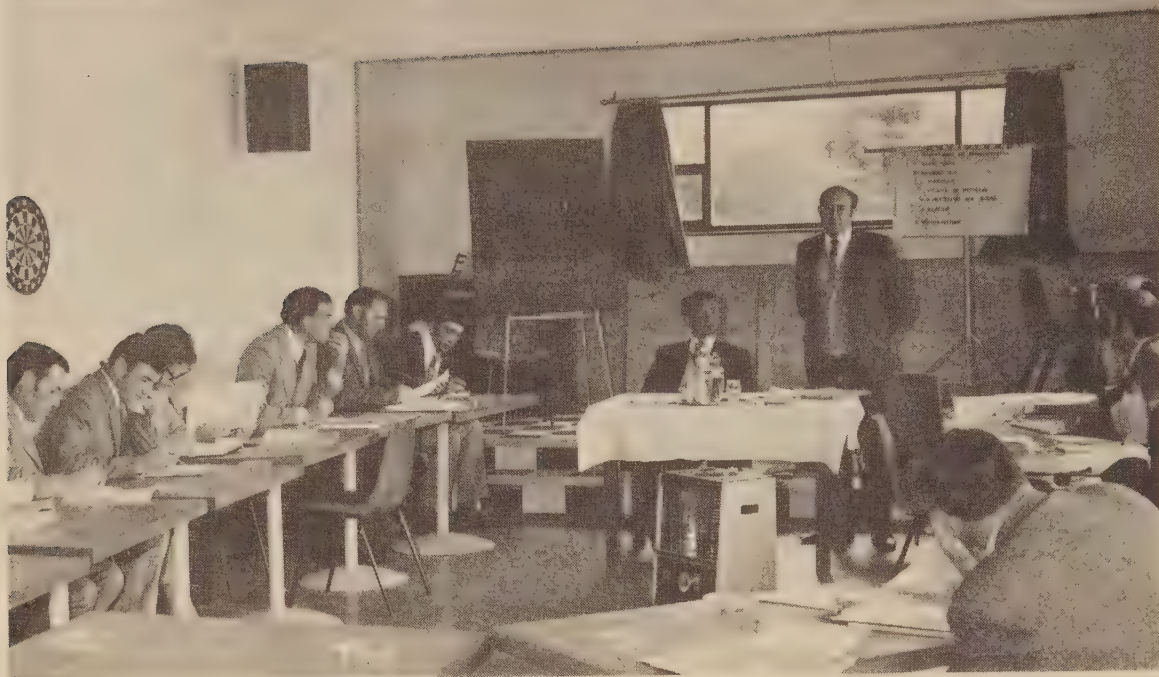
Cattle have been introduced in the higher rainfall parts of the eastern areas of this Region, the most striking example perhaps being the Burgersdorp district where the percentage of large stock increased from 5 per cent to 25 per cent from 1961/62 to 1975/76.

Mutton sheep farming is steadily gaining ground and the production of mohair has increased considerably, even in the higher rainfall areas, such as parts of the Burgersdorp district where the Merino constituted up to 94,8 per cent of the sheep population in 1962, but only 85,0 per cent in 1974.

In the Fish River Valley an unprecedented interest has developed in the more effective utilisation of land that can be put under irrigation now that farmers in the valley are assured of a regular water supply from the Hendrik Verwoerd Dam.

A comprehensive communication programme has consequently been worked out for the Fish River Valley by this Region, under which attention will be paid to the following three aspects in particular during the coming year:

- Dairy farming.



A short course in farming management was offered for the mail-in record study group of Bredasdorp/Riversdal. The course was directed by Agricultural Economists and was arranged by the extension officers of the wards concerned

- The physical lay-out and planning of irrigation farms.
- Mechanisation on the farm.

FREE STATE REGION

As regards stock production on natural veld, there is a growing interest in large stock in preference to sheep. This can be attributed to the lush growth of the veld and the successful utilisation of the veld by large stock. Fewer problems were experienced with large stock than with small stock throughout, particularly because the latter could not utilise the scrubby grass veld satisfactorily without preliminary grazing by large stock and also because sheep are more subject to limiting factors partly occasioned by mosquitoes and persistent humid conditions. In most subregions it was also found that the lush natural grazing encourages a tendency to overstocking.

Interest in cash crops in marginal areas has been fostered by the favourable seasons of late. In Petrusburg an additional area of about 4 000 ha has been ploughed. Maize, sunflowers and wheat are being planted in the marginal areas and interest in feed sorghums is flagging. Attention to choice of soil and the effective preparation of seed beds yield good results with cash crops on marginal soils.

Drainage and the reclamation of brackish soil are the main considerations in the irrigation areas. Interest in sprinkler irrigation is also increasing.

Viticulture is still receiving attention but excessive expansion is not expected because unfavourable weather conditions have resulted in a considerable number of unsuccessful plantings and because the risk in summer rain conditions has been emphasised by the quality of the harvest. Viticulture is an established industry in the Upington area and normal expansion is taking place.

There is a keen interest in the use of chemical herbicides, and farmers using this aid obtained large crops throughout the Region. Their crops served as an example to other farmers because heavy rains often made mechanical weed control impossible on lands adjacent to chemically treated crops.

TRANSVAAL REGION

The success with dryland wheat cultivation on the Springbok Flats is having a ripple effect, particularly westwards toward the Bushveld parts north of Zeerust. The same black turf soil types and an even more favourable climate are found in these parts, and will probably result in a considerable expansion of wheat cultivation.

In the Eastern Transvaal traditional cattle grazing regions such as the Strydom Block are undergoing a rapid change-over from intensive cattle farming to large-scale irrigation enterprises. Initially vegetables are playing a large part in this



- VERKLARING** **LEGEND**
STREKE **REGIONS**
- Winterreën ① Winter Rainfall
Oos-Kaap ② Eastern Cape
Karoo ③ Karoo
Natal ④ Natal
Oranje Vrystaat ⑤ Orange Free State
Hoëveld ⑥ Highveld
Transvaal ⑦ Transvaal
- Voorligtingswykkantoor ● Extension Office
Substreekkantoor ★ Sub Regional Office
Streekkantoor met Wykkantoor ● Regional Office with Extension office
- Streekgrense ——— Regional Boundaries
Substreekgrense ——— Sub Regional Boundaries
Voorligtingswykgrense ——— Extension Area Boundaries

REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES
REGIONS, SUB-REGIONS AND EXTENSION AREAS
30 th June 1973

REPUBLIEK VAN SUID-AFRIKA
DEPARTEMENT VAN LANDBOU-TEGNIËSE DIENSTE
STREKE, SUBSTREKE EN VOORLIGTINGSWYKE
30 Junie 1973



Handmade woollen articles on exhibit at the farmers' day held in November 1976 at the Carnarvon Research Station. The theme of the farmers' day was wool promotion

transition process, with a gradual change-over to sugar-cane cultivation.

In certain subregions it is clear that extension officers spend up to 80 per cent of their time on programmed extension activities within target areas. This is definitely a new trend in the working methods followed.

In addition to this the extension inputs of the past three years in the North-Western Transvaal Subregion have been scientifically evaluated for the first time. The increase in the knowledge of farmers involved in these communication programmes and their readiness to apply new practices were striking.

To determine how the average extension officer and technician spend their time, a control inspection of the diary report was done from the regional office random sample of professional officers and technicians, and this enabled the management to guide subregional leaders on where the emphasis should fall in field activities.

NATAL REGION

In the Natal Region the computer programme facilities for feed planning and cost calculations for dairy and meat farming enterprises have been refined and improved to such an extent that a total of 238 farmers and enterprises could make use of these facilities during the year. A computer programme to calculate concentrate supplementation with various roughages for dairy

cows was also written and tried out successfully during the year.

It is expected that this Region's recently completed erosion simulation model, based on soil loss as related to soil type, slope, climate and soil utilisation, will be of great value in future use in the field. It will also make computer facilities available for use in soil conservation.

Considerable progress was made with specifications for various farming enterprises, especially agricultural crops and artificial pastures. A number of manuals were published, among them *Feeding of Dairy Cows in Natal* which was made available as an excellent extension instrument.

PROGRESS WITH PROGRAMME PLANNING

EASTERN CAPE REGION

The implementation of predetermined programmes forms an integral part of the working method of the extension service in this Region. Soil conservation committees function as programme planning committees for drawing up and initiating programmes, while farmers' associations and study groups are used as platforms for the propagation of the programmes. The aim is to maintain a sound balance between conservation and development aspects, in line with the policy of the Department, namely *optimal land use aimed at agricultural development*.

Veld improvement and utilisation

Attention was paid to 19 registered liaison projects under this key programme.

Nine of the liaison projects pay special attention to veld improvement by systematic rotational grazing and resting, or by achieving the desired stocking rate and/or large stock:small stock ratio on the veld.

A good example of this type of project and of the progress made is the rotational resting programme in the Molteno Extension Ward. The object of this programme is to persuade farmers in this Extension Ward to apply a systematic rotational resting programme to at least 80 per cent of all grazing within five years (from 1 July 1972). This will mean that 75 per cent of all grazing will have to be rested in rotation for at least six consecutive summer months every season.

Progress

The percentage of grazing rested for at least six consecutive summer months between September and March in the Molteno Extension Ward (1970 to 1976)

70/71	71/72	72/73	73/74	74/75	75/76
39%	38%	35%	47,4%	43,5%	48,9%

Although favourable rainy seasons contributed largely to the high percentage of veld rested, the progress made with other programmes points to a definite change in attitude among farmers to veld management. The progress made with the dryland lucerne programme as well as the group-camp system serves as a barometer of the favourable change in the farmers' attitude towards grazing management.

The fact that 68 per cent of the farmers apply a rotational resting programme to their grazing, provides further proof of this change. The farms on which good grazing management is applied are easy to spot. Not only does the veld on these farms make a quicker and better recovery than that on other farms, but the quality of the veld is also much better.

Good progress was made with similar registered projects in the Aliwal North, Queenstown, Uitenhage, Barkly East, Dordrecht and Molteno Extension Wards.

WINTER RAINFALL REGION

Of the 62 registered extension programmes in this Region, 24 relate to the production efficiency of certain crops, 18 to the mechanical protection of fields, 10 to grazing improvement, 6 to brack control and 4 to the classification of resources.

The progress and further development of one of these programmes are briefly outlined as follows:

Improvement of viticultural practices in the Montagu Ward

An evaluation revealed the following important changes in practices:

- An increase in the planting of better quality wine grapes such as Raisin blanc (15,7%), Colombard (6,2%) and Steen (4,2%) at the expense of cultivars such as Fransdruif (16,1%), Cinsaut (8,0%) and Belies (4,1%).
- Wider spacing with a view to mechanical cultivation and training systems shows an increase of 54,3% compared to the initial situation.
- In vineyards older than three years 73,6% of the plantings comprise bush-trained vine or have single-strand training systems, whereas 74,4% of the new plantings have two- or three-strand training systems.
- Deficiencies in respect of soil preparation, disease control and fertilising were identified and necessitate a shift in emphasis in the working plan.

A survey of water sources in the Montagu Extension Ward revealed that, *inter alia*,

1. boreholes provide 64% of the irrigation water in the Ward, apportioned water from rivers provides 18,3% and storage dams provide 17,7% annually;
2. only one out of every 2,5 boreholes drilled, yields water;
3. the average yield per borehole for a total of 257 holes amounts to 16 800 litres/hour;
4. the capital expenditure attached to the drilling of a hole and the erection of pump equipment amounts to almost R3 000, and the running cost per hole averages at R661 a year;
5. only 36% of the water samples from boreholes have a sodium content lower than 100 ppm, while only 24% of the samples have a chlorine content of less than 150 ppm;
6. apportioned water, spring water and dam water are generally of a high quality;
7. rivers are not perennial and moreover serve as drainage channels, with the result that river water is totally unsuitable for irrigation unless the river flow is strong;
8. about 4% of the arable land involved in the survey had already become so brackish that it was unfit for crop cultivation.

Arising from the results of this survey the following progress was made during the past year:

- 16 farmers were persuaded to stop using 49 boreholes yielding water of a very poor quality;
- 72% of the farmers were persuaded to mix borehole water with their apportioned water, spring water or dam water to obtain water of a better quality.

The results of a few other highly successful programmes are mentioned briefly below.

HEX RIVER VALLEY SOIL CLASSIFICATION

This project has been completed. Approximately 4000 ha has been classified and

mapped to the scale 1:10 000. This was a comprehensive task from a soil classification point of view and 403 man-days were devoted to it (about 10 ha per man-day).

Stellenbosch soil classification

27 farms with a combined area of 5 467 ha were mapped, 600 ha to the scale 1:10 000 and the rest to the scale 1:5 000.

Physical planning of wet and brackish land at Stellenbosch

795 ha of land (19 farms) was zoned for drainage. 130 ha of this land was surveyed and drained, while the rest is being planned.

Grazing project at Stellenbosch

95 ha of vlei was planted to pastures during the year under review, a considerably larger area than the target.

Land use planning project at Stellenbosch

Under this project in which land use units are delimited according to the soil lines, four farms with a combined area of 3 524 ha have been fully mapped and planned. To determine the optimal cultivar for each soil unit, study groups were formed at five co-operative wineries producing and evaluating experimental wines in co-operation with the Oenological and Viticultural Research Institute.

KAROO REGION

The approach to extension in this Region is reflected by the communication programme planned for the Upper Fish River Valley.

This communication activity arises from the findings of a project during which irrigation farming in the Upper Fish River Valley was investigated.

Tabel 1 on the next page gives the working calendar for the 1976/77 year.

The success achieved in this Region with the propagation of drought fodder crops is illustrated by the programme in the Jansenville Extension Ward.

An evaluation of the progress in the planting of drought fodder crops in the Magisterial Districts of Jansenville and Steytlerville has been made over a period of four years. The data of 150 farm units have been carefully recorded over the period of four years and the following appears to be an accurate reflection of the situation in the two Magisterial Districts. The areas planted by the 150 farmers in addition to existing plantings during the year under review are as follows:

Cactus	-	82 ha
Old-man saltbush	-	81 ha
American aloe	-	38 ha

The total plantings on the 150 farms are as follows:

Cactus	-	506 ha
Old-man saltbush	-	322 ha
American aloe	-	90 ha.

FREE STATE REGION

Extension activities with the object of identifying farming situations or of promoting better farming practices are carried out by means of programme planning throughout. All the manned extension wards in this Region have one or more extension programmes dealing with the most important farming problems of the Ward. The following are examples of extension programmes in operation in the Region:

Production techniques and study of yield norms

At present 115 participants are collaborating in this long-term programme. The first year's results relating to field crops show that soil types and cultivation practices are responsible for large differences in yields, in spite of the relatively favourable moisture conditions. Animal science data are being collected and tabulated and the results will be made available during the coming year.

Control of veld fires

Various programmes aiming at the effective control of veld fires are under way. These programmes have brought about a remarkably positive attitude among farmers towards measures for the control of veld fires. They have also resulted in the establishment of extremely efficient organisations for the prevention and control of veld fires by groups of farmers in the Region.

Provision of facilities for the application of effective veld management

The results of these programmes show that a relatively small percentage (about 25%) of the farmers in the Postmasburg Soil Conservation District have sufficient internal camps to practise efficient grazing and herd management. The same situation exists in other stock-farming districts in the Region.

Increase of irrigation efficiency on farms at Vaalharts

During the year under review internal drainage systems were designed and completed by farmers for which R85 773 was paid out. The drainage systems are very efficient and it is clear that this programme enjoys high priority in the Vaalharts Irrigation Scheme. The lack of adequate diversion facilities for internal drainage systems is hampering this programme. The programme has also led to a positive attitude among farmers.

TABLE 1 - Communication programme for the Fish River Valley: 1976/77

Dates	Farmers' Days	Nature of meetings Hour Meetings	Other Meetings
	<i>Dairy farming</i> 1 Feeding 2 Management 3 Health 4 Economics		
August			
September		Planning of mechanising of milking shed	Visits to milking sheds of 3 farmers
October		Production of forage crops for dairy cattle	Meeting of liaison committee
November		Hygiene in the milking shed	
January		Raising of calves	
February	<i>Planning of irrigation farm</i> (1) Physical and hydrological plan; (2) Irrigation scheduling; (3) Drainage - Agricultural eng.		Meeting for the establishment of a study group for the Middle Fish River area
March		Crop production under irrigation	
March		Fertilising needs	
April		The economics of irrigation farming	
May	<i>Mechanising of irrigation farming</i> (1) Choice of tractors; (2) Soil cultivation implements; (3) Harvesters and threshing-machines		Meeting for the establishment of a study group for the Lower Fish River area
June			Day course on tractor maintenance for White farmers
June			Day course on tractor maintenance for Non-White labourers

HIGHVELD REGION

The progress made with agricultural development in certain development areas in this Region is shown in Table 2 on the next page.

TRANSVAAL REGION

During the year under review 23 liaison projects were registered in the name of extension officers and technicians. Of these, 21 projects were ancillary to the key programme entitled *The Formulation of Adapted Farming Systems in the Transvaal Region*, and two projects were ancillary to the key programme, *The Communication of Adapted Farmings System in the Transvaal Region*.

Remarkable progress was made with run-off control planning in target areas by the technicians when it is taken into account that three such plannings, based on a complete soil map, were completed during the year.

Extension officers made satisfactory progress with liaison projects.

The two communication liaison projects in the North-Western Transvaal have made excellent progress and have already been scientifically evaluated with the aid of survey schedules, use being made of a sample of farmers in the target areas concerned.

In the South-Eastern Transvaal Subregion a comprehensive investigation into fresh-milk farming by means of a liaison project was completed during the year under review. The report has been drawn up and is being prepared as a Technical Communication. The investigation and report are a milestone for the fresh-milk industry in this Region because extension programmes can now be profitably based on them.

NATAL REGION

Two further production programmes were registered by the Natal Region during the year, namely a beef production programme at Melmoth and a maize production programme at Greytown.

Consequently liaison projects in the Natal Region now cover the following aspects:

Aspect	Number of projects
Beef production	5
Fresh-milk production	1
Maize production	2
Soil conservation	2

The following summary of the progress made with the beef production programme serves to illustrate what is achieved by these projects in this Region:

The feed budget programme for 100 cattle farmers in the Underberg Soil Conservation District which was planned to extend over five years has been completed in less than four years. During the past year 23 plannings were done, 322 soil samples were taken and 65 feed samples were analysed for the programme. This programme is now being concluded.

The beef production intensification programme in the Swartberg part of Griqualand East, in which 28 farmers are involved, shows the following progress:

- A complete planning was done on four farms.
- A feed budget was completed for four farmers.
- Six farmers formed an economics study group.

TABLE 2 - Progress made with Agricultural Development Programme

	1973/74	1974/75	1975/76	Total
1. Number of development areas	7	7	4	18
Area involved	91 772	99 920	32 902	244 594
Number of farming units	227	192	91	510
2. Area stereoscopically classified in mapping units (ha)	139 011	60 781	24 764	216 456
% of total				96%
3. Area of stereoscopic classifications checked in veld (ha)	80 703	92 614	17 470	190 797
% of total				85%
4. Area of profile descriptions and sampling completed (ha)	47 679	95 892	30 752	174 323
% of total				77,6%
5. Area of aerial photographs finally rounded off and information transferred to codification forms	16 430	87 568	68 778	172 776
% of total				77%
6. Number of extension surveys	-	259	94	353
7. Regional soil maps with legends fully completed	-	-	4	4
8. Number of project reports completed	-	-	2	2
9. Number of field crop guides completed	-	-	3	3
10. Abbreviated field crop guides and maps made available to farmers in the development areas	-	-	-	-

- Two articles on soil analysis were published in the local newspaper.
- One article on the quality of silage was distributed among the farmers.
- Circulars in connection with AI and herd management for beef cattle were distributed among farmers.
- An AI course was held.

STUDY GROUPS AND PLANNING COMMITTEES

EASTERN CAPE REGION

There are 23 study groups in this Region, 11 of which can be described as "very active" and 12 as "active". Because stock-farming is the main enterprise in this Region 20 study groups are concentrating on problems relating to animal science.

Of the 312 members of study groups, 250 take part in the mail-in record system. Only three study groups in the Region do not participate in the mail-in record system at all. This lively interest in the economic side of farming indicates that farmers are becoming more economics-minded and also

that they realise the usefulness of the study group in encouraging them to farm more efficiently.

Their enthusiasm is also fostered by the regular visits to study groups of the regional economists and extension officers during which valuable guidance and assistance are given in the interpretation of their economic analyses.

Good progress has been made with the diagnosis of deficiencies in the farming operations of individual members as well as with the rectification of these deficiencies. The most common deficiencies in the Region are unsatisfactory calving and lambing percentages and high labour and mechanisation costs.

The results of the Smaldeel Study Group, which are considered to be fairly representative, serve as a good example of the progress made in the field of economics. The net farm income has increased from R7,87 per hectare in 1973 to R12,32 per hectare in 1975. Beef cattle show an encouraging gross margin of R85,74 per large stock unit. Beef cattle constitute 32 per cent of the livestock population, whereas fine-woolled sheep constitute 43 per cent. The rest of the stock enterprises consist of goats and dairy cattle.

The situation as regards programme planning committees is shown in Table 3.

The situation as regards programme planning committees is shown in the table on the following page.

The number of programme planning committees decreased by one during the past year with the disbanding of the Kat River catchment area planning committee in the Fort Beaufort Extension Ward on the completion of its project. Four registered projects were concluded during the year under review.

WINTER RAINFALL REGION

There are 63 active study groups in this Region, 16 of which are mail-in record study groups, with a total membership of 632. During the year under review 214 meetings were held. The staff of the extension offices, in co-operation with economists from the Agricultural Production Economics Division attached to the Region, are making a major contribution to the effective functioning of these study groups.

Study groups pay attention to the following subjects: dairy production, wheat production, grazing improvement, table grape cultivation, evaluation of wine grape cultivars, tobacco cultivation, agricultural mechanisation and labourers' wages.

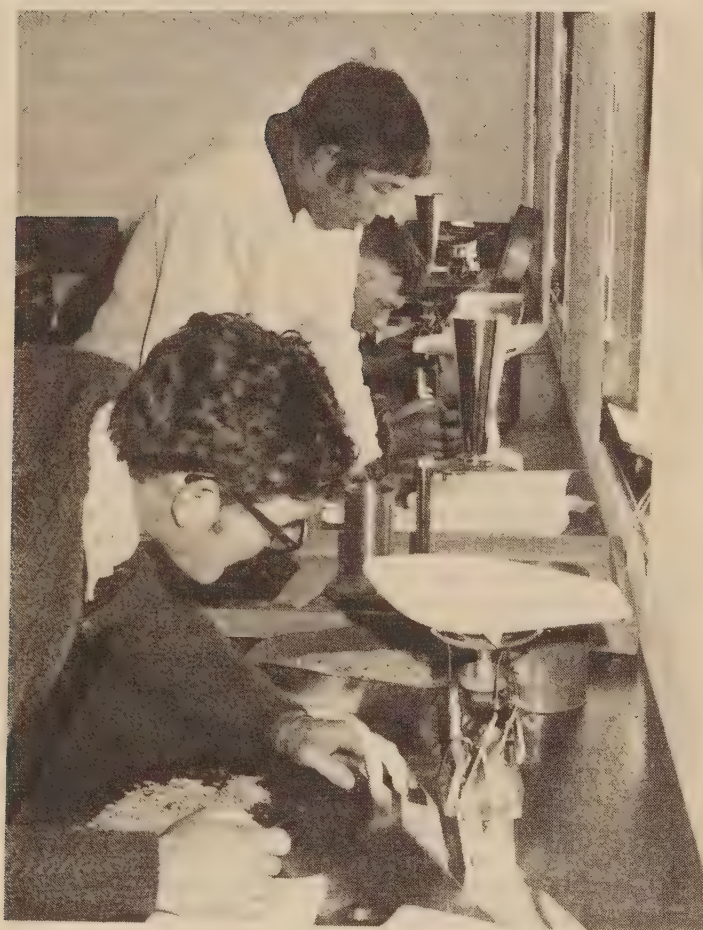
SOUTH-WEST AFRICA REGION

In the Northern Subregion four soil conservation committees act as umbrella programme planning committees and plan all extension activities. Mail-in record study groups have increased to eight during the past year, and good results are being obtained already.

Good results are also being obtained in the Central Subregion by the study groups for the following:

TABLE 3 - The number of programme planning committees in the Eastern Cape Region and programmes for which they are responsible:

Subregion	Extension ward	Number of committees	Membership	Registered projects	Registered projects completed	Unregistered projects
North-Eastern	Aliwal North	3	21	8	1	-
	Barkly East	1	10	3	1	5
	Dordrecht	2	14	4	-	7
	Molteno	1	7	4	2	-
	Elliot	3	21	-	-	4
Central	Queenstown	3	23	4	-	-
	Adelaide	1	10	1	-	-
Border	East London	2	11	1	-	1
	Stutterheim	1	4	1	-	-
	Grahamstown	1	6	1	-	1
East Coast	Port Elizabeth	1	9	1	-	-
	Uitenhage	1	14	2	-	-
	Humansdorp	2	18	2	-	-
		22	168	32	4	18



Young men attending a course in graingrading, offered at Welgevallen, Stellenbosch by the Winter Rainfall Region

1. Establishment of climax grasses in the veld by planting cuttings and sowing clay-pelleted grass seed.

2. The improvement of puddled veld by ploughed furrows and the intersowing of grasses.

3. Veld improvement by the application of various grazing systems.

4. Increasing calving percentage.
5. Six study groups for the determination of the following in their respective areas:

- Record-keeping and weighing of beef cattle on veld grazing.
 - Determination of meat production per hectare.
 - Determination of lick intake with various grazing systems.

Students in Viticulture are seen grafting vine cuttings. The photograph was taken at Elsenburg



KAROO REGION

The 34 study groups with a membership of 248 held 91 meetings or gatherings during the year under review.

The activities and success of two of these study groups show what a study group can achieve.

1. The object of the Waterford Economics Study Group, consisting of six members, is to run their farms as economically as possible and to pass on the knowledge gained to their fellow farmers. In one year the net farm income was stepped up by 7,6 per cent and the lambing percentage of Merinos, mutton sheep and Boer goats was increased from 84,07 to 98,96; 130,26 to 187,30 and 103,99 to 164,57 respectively.

The results obtained by the group were discussed during a field day, at four farmers' association meetings and at two soil conservation committee meetings and were passed on to fellow farmers.

2. The object of the Merino Ewe Study Group, consisting of eight members, is to try to increase reproduction with the aid of thorough record-keeping. Mortalities among lambs from birth to weaning were investigated during the year under review. It was found that nine per cent of the losses could be attributed to abortion and that the help of the Division of Veterinary Services should be called in. A further seven per cent of the losses were caused by vermin, while cold weather conditions were responsible for as much as four per cent.

FREE STATE REGION

There are 40 study groups with a membership of 456 farmers in this Region. During the year under review 220 meetings were held. It is clear, however, that the activity of study groups is closely related to the amount of guidance received from the extension staff.

Soil conservation committees in the Region

are used as planning committees throughout. These committees play an important part in the extension activities and make a major contribution to the agricultural development task. Soil conservation committees focus on matters such as the control of veld fires, cultivation practices, crop and stock-farming aspects, and advice on erosion problems.

These committees undertake their task in a well-ordered way by formulating objectives and drawing up a programme of action according to which their task can be performed and evaluated systematically. There is an excellent spirit between officers and soil conservation committee members which creates opportunities for extension and undoubtedly broadens the impact of extension.

HIGHVELD REGION

The 22 study groups with a membership of 425 in this Region held an average of five meetings per study group.

A few examples are cited to illustrate successes achieved.

1. A General Production Study Group from Frankfort travelled to Rhodesia to study stock and maize farming. The same group runs an annual herd competition.
2. A Dairy Study Group from Bethal went to Natal in May 1976 to investigate the economic aspects and feeding of dairy cattle in particular.
3. A study group from Clocolan undertook maize cultivar studies and investigated minimum cultivation methods at the same time.
4. The Ladybrand Study Group keeps production records and is trying to relate management practices to soil potential. Mail-in record data indicate that the group average has already increased its net farm income per R100 of capital investment from R7 to R12.



Students of the Grootfontein Agricultural College are seen classifying wool

TRANSVAAL REGION

The following outline of the activities of study groups in this Region indicate the extent to which such groups are used by the extension officer and the part they play in the quest for knowledge at the practical farming level.

The degree of success with which study groups and planning committees are being used is evident from the following outline of the activities in the North-Western Transvaal Subregion:

There is a total of 17 active study groups with a combined membership of 164 in this Subregion. These study groups are all highly activated and form one of the most important cornerstones of the communication programmes. Evaluation surveys have shown that study group members' knowledge of veld and stock management practices is significantly superior to that of farmers who do not belong to study groups. Members of study groups are also used to pass on knowledge to those farmers who cannot be reached through the normal communication channels.

The 17 study groups, four of which were established only during March 1976, held 77 meetings during the year under review. Four programme planning committees with a membership of 32 also function in this Subregion. These committees held 34 meetings during the year under review.

Two of the ten study groups in the Northern Transvaal Subregion were established during the

past year. The study groups in the Pietersburg and Potgietersrus districts are used by the local extension officer mainly to implement the communication programme. Where possible, one study group in each ward is also used as a full-fledged mail-in record study group.

The purposefulness of the study groups of today is evident from the report of the Eastern Transvaal Subregion:

Owing to the switch from cattle farming to vegetable farming in the Strydom Block target area the Cattle Study Group will be converted into a Tomato Study Group, or if possible, both study groups will function alongside each other.

A factory tomato study group was also established for the Hoedspruit - Klaserie area with the object of increasing production. A very successful farmers' day was held by this group. The well-established banana study group in the area recently received the analysis of the first year's mail-in records, the results of which are very informative.

Various tobacco study groups were established by the Lowveld Tobacco Co-operative Society to which Departmental officers are co-opted in an advisory capacity.

NATAL REGION

The 31 active study groups with a membership of 442 still appear to be the most

important extension medium and source of information in this Region. During the year under review a total of 105 meetings or gatherings were held by the study groups.

The following are a few examples of what has been achieved by study groups in Natal:

1. The study group for the protection of sugar-cane fields in the Port Shepstone Soil Conservation District concentrates on fields with a slope of more than 16%, in particular where panel cultivation is encouraged. Their working plan includes farm visits, the distribution of pamphlets, educational programmes for schoolchildren and the publication of an annual newsletter.
2. The study group for banana production on the Lower South Coast of Natal became a scientific subcommittee of the Natal Banana Association during the past year and has broadened its field of study to include other subtropical fruit such as macadamia nuts and guavas.
3. The newly established study group for the combating of bush encroachment in the Magudu area has made exceptional progress with bush control experiments.
4. A new economics study group which includes 10 dairy farmers was formed in the Howick Extension Ward during the past year.

The soil conservation committees still play an important part in programme planning committees. During the year under review nine committees with a membership of 58 were actively involved in agricultural development. Similarly 13 committees with a membership of 90 were active in the protection of the soil.

The objects of these planning committees in the Natal Region include the following:

- Promotion of beef production.
- Promotion of milk production.
- Promotion of maize production.
- Protection of fields.
- Promotion of bench-terraces among Indian farmers and construction of such terraces.
- Promotion of banana production.
- Economic planning.
- Irrigation planning.
- Feed planning.

CONSERVATION FARMING COMPETITIONS

EASTERN CAPE REGION

During the year under review nine conservation farming competitions were held, followed by conservation days on five farms. These farmers' days were attended by 308 farmers.

Two competitions were held in the Molteno Ward. One of these was a management competition, i.e. for the person who, with his available resources, could maintain the highest possible sustained economic production over a long period.

The other was a specialist competition where the soil conservation committee could enter any farmer for some exceptional achievement. This year's winner, for instance, was chosen because of the contours he had built. The winner of the competition at Bathurst, on the other hand, was chosen for the way in which he had transformed old pineapple fields into lush grazing.

SOUTH-WEST AFRICA REGION

Conservation farming competitions are still gaining ground in this Region and are utilised to the full by holding farmers' days on the farms of winners. Such farmers' days attract great interest and are usually attended by large numbers of farmers. In the Southern Subregion six conservation farming competitions were held.

One and two star farming competitions took place in all four of the extension wards in the Central Subregion during the past year. As in the past, the farming competitions were part of the working calendar of the programme planning committees. During the year under review a master conservation farmer was designated in the Omaruru/Karibib Extension Ward, which brings the total to eight master conservation farmers in this Subregion.

This type of competition was also held in other regions, namely the Winter Rainfall Region (3), the Free State Region (8), the Highveld Region (1) and the Transvaal Region (2).

In the Natal Region 14 meetings were held which involved a record number of 159 participants. Statistics kept indicate that 40 per cent of the soil conservation committees in the Natal Region organised such competitions.

EXTENSION RESEARCH AND SURVEYS

Surveys involving 622 farmers were carried out continuously in the North-Eastern Subregion of the *Eastern Cape Region*.

This comprehensive survey covers a wider field than the existing extension programmes and gives an idea of the methods applied in utilising natural resources on farms. The progress with programmes is also evaluated on the basis of this survey.

The following are some of the aspects of farming receiving attention in the *Winter Rainfall Region*:

- In the Boland Subregion four extension officers are now involved in practical research on irrigation scheduling with the aid of tensiometers.
- Data from the apple cultivation practices study (Ceres) and the table grape cultivation practices study (Hex River Valley and Upper Berg Area) have been processed, and valuable indications of adapted and incorrect practices as well as yield norms on various soil types were obtained.

- Wheat belt sowing demonstrations were held in co-operation with the Agronomy Section and Co-operative Societies on 13 farms in the Swartland and 17 farms in the Southern Cape Subregion.
 - The collection of meteorological data and the observation of the incidence of diseases were a valuable contribution to the research programme on powdery mildew of lupins.
 - Grazing research was started in the Little Karoo Subregion on a co-operative basis to evaluate the feasibility and economic aspects of radical veld improvement methods.
- In the *Free State Region* the following investigations, amongst others, were commenced:
- An investigation into the carrying capacity of grazing supplemented by *Cenchrus ciliaris* was instituted in the Mafeking district. This study showed that the average daily weight increase on *Cenchrus* grazing alone was 0,45 kg for cows and 0,89 kg for calves during the period December 1975 to March 1976.
 - The farm planning situations in the Vryburg, Molopo, Postmasburg and Olifantshoek Soil Conservation Districts were evaluated. In the Vryburg Soil Conservation District, for instance, it was found that 52,3 per cent of the plannings had been fully implemented, that dryland cultivation had increased by 0,9% and that the number of plannings fully implemented according to regional norms had increased by 6%.
 - The farming situation in the Sannaspos, Tweespruit and Bloemfontein North Soil Conservation Districts: The survey showed that the following percentages of dryland in the soil conservation districts were being utilised for the purposes indicated.

Sannaspos		Tweespruit	Bloemfontein North
Winter wheat	28,2%	41,6%	37,9%
Maize	8,1%	8,5%	40,1%
Feed sorghums (annual)	18,3%	3,7%	4,4%

In the *Highveld Region* special attention was paid to the subject of yield formulas. The following significant results give an indication of the extent and value of this research.

1. Potato yield studies

This crop plays an important part in the production pattern of the Highveld Region. This Region produces 52% of the potatoes in the Republic. As with other crops it was possible to establish a yield formula based on rainfall, soil depth, moisture regime and crop characteristics.

The accuracy of the formula was tested during 46 yield studies. It was found that long-term yields in the Bethal and Delmas areas amount to 80% of the calculated yield.

In the *Free State* part of the Highveld an average yield of 70% of the calculated yield was

obtained. By using yield formulas during land use planning, the planner can now make objective decisions on the choice of crops and optimum soil utilisation.

2. Maize yield determinations on soil variants

A total of 92 maize yield determinations were undertaken in eight development areas to determine the yield capacity of soil variants. Processing of the information gathered shows that the average yield (336 kg/ha) constitutes 72% of the calculated yield (4 633 kg/ha), which corresponds with previous findings in this Region. A study of nitrogen fertilising shows that the closer the applications are to the norm, the closer the yield obtained is to the calculated yield. In the Vierfontein area, where 75% of the necessary nitrogen was applied, 86% of the calculated yield was obtained. The same trend was determined for phosphate fertilising.

Deviating Ca:Mg ratios of less than 2:1 in the subsoil were found in 76 of the 92 studies, being accompanied by clay leachings and deterioration of the moisture regime of the subsoil. This finding corresponds with the soil analysis data for areas in the Highveld where intensive soil classification was undertaken. A further investigation into this phenomenon is being planned.

3. Determinations of dry matter on classes of slopes and veld cover

The dry matter yield was determined at 100 selected places to enable extension staff to make carrying capacity figures available in respect of the various classes of slopes and veld covers. With the aid of information gathered tentative figures were established for all farming areas of the Highveld Region. In future, therefore, the determination of carrying capacity will no longer be a matter of opinion, but will be based on facts. This work was registered as a research project and will be repeated during the next five seasons.

In the *Transvaal Region* seven situation determinations were carried out in target areas. These surveys were conducted with the aid of standardised interview schedules and the information obtained was processed with the aid of general computer programmes.

Two separate surveys were undertaken in the North-Western Transvaal, namely an interim evaluation of two communication programmes that have been under way for three years. These surveys revealed a remarkable improvement in farmers' knowledge of veld and veld management practices. But it is also clear that stock management practices still leave much to be desired.

The surveys further showed that newsletters, mini farmers' days and study groups have the highest value as communication media.

A complete survey of 18 State works was undertaken in the Pietersburg Ward.

Soil surveys are an important facet of liaison projects in this Region at present. In this respect two land surveys were completed in target areas

which covered a total area of 36 000 ha. This brings the total area mapped during the past two years to approximately 200 000 ha.

During the past year the sophisticated computer models developed by the *Natal Region* have clearly proved their very great value to progressive dairy farmers, as well as to entrepreneurs who fatten up cattle, provided they also keep good records.

During the past year land surveys were completed on 9 900 ha of fields in the Tala Valley on land which is mostly under irrigation and is utilised for vegetable cultivation.

The Land Use Unit mapped a total of 16 350 ha of land in Natal in detail during the past year at the request of the Extension and Research sections of this Department and other departments.

An intensive survey of maize cultivation practices on 40 farms in the Greytown Extension Ward was completed during the past year as part of the maize production programme.

IN-SERVICE TRAINING

Four chief technicians from the *Eastern Cape Region* attended a supervisor's course.

The following in-service training was undertaken in the *Winter Rainfall Region*:

- A three-day course in the construction of contour banks was attended by 18 officers, a further three-day course in programme planning by 32 officers and a one-day course on merit assessment was attended by 33 officers.
- Seventeen officers attended various short courses held for farmers.
- In the Boland Subregion special efforts were made to familiarise officers with soil classification, and seven technicians were directly involved in soil classification in the Hex River Valley. 12 Subregional conferences were also held solely for training purposes.
- The extension officer of Riversdale was given the opportunity to go to Australia during February/March 1976 to make a study of extension aspects and gather data on wheat cultivation practices and summering techniques and practices with dairy cattle.

In the *South-West Africa Region* two serving extension officers obtained the degree B.Agric.(Hons.)(Inst.Agrar.).

Five officers in the *Karoo Region* attended courses in advanced management techniques, supervision and the feeding of animals.

The following in-service training courses were taken by staff in the *Free State Region* (the number of officers who attended each course is given in brackets): Farm planning according to soil potential classes (12), viticulture (4), tobacco (4), Dorper sheep (4), irrigation (2), modern management techniques (2), planning in mechanisation (1), sheep and wool (1), tractor maintenance (1) and soil classification (2).

In the *Highveld Region* 11 officers attended short courses in mechanisation planning.

In the *Transvaal Region* the majority of extension officers and technicians attended crash courses in agricultural engineering.

Four extension officers from dairy areas attended a five-day course in the computerising of dairy farming data at the Cedara Agricultural College.

The following courses were attended in the *Natal Region* (the attendance figures include farmers): Beef cattle model (22), computerised feed charts for lactating cows (22), soil identification (37), vegetable production (240), pruning course (45), AI (23), dairy model (32), credit and the farmer (60), AI (25).

AGRICULTURAL EDUCATION

The following table gives the numbers of students following diploma courses at colleges of agriculture:

Student numbers at colleges of agriculture

The figures in brackets are for the previous year.

College	Student numbers	
Cedara	123	(127)
Glen	80	(57)
Grootfontein	90	(89)
Neudam	38	(39)
Potchefstroom	115	(123)
Stellenbosch-Elsenburg	135	(115)
Total	581	(550)

Colleges of agriculture also make a valuable contribution to agricultural training by presenting short courses.

The following table gives an indication of the extent of this educational task, particularly for farmers.

College	Number of courses	Attendance figures
Cedara	6	94
Glen	19*	359
Grootfontein	9*	240
Potchefstroom	40*	1 306
Stellenbosch-Elsenburg	20	729
	94	2 728

*Includes all courses held in the region concerned

SUMMARY OF ACTIVITIES

The table on the following page gives an indication of the time spent by the extension officer and technician on specific key tasks and of the scope of the agricultural services rendered.

The second table on the next page, shows the activities undertaken by the extension service in the execution of its task.

Activity	Professional officers 1975/76		Technicians 1975/76	
	% Time spent	Statistics	% Time spent	Statistics
A1 Travelling: Self	12,8	1 230 805 km	11,9	2 101 474 km
A2 Travelling: As passenger	4,6	457 328 km	4,0	770 623 km
B Survey visits	11,5	8 446	12,2	18 165
C Inspection visits	2,9	2 148	6,7	9 584
D Extension visits	18,2	11 497	6,5	6 935
E1 Surveys (contours)	0,01	45,4	2,2	6 586
E2 Surveys (pipelines)	-	-	4,6	8 105
E3 Surveys (other)	13,7	1 321 214 min. (22 020 hrs.)	6,9	1 198 812 min. (19 980 hrs.)
G Interviews	15,7	35 755	12,4	50 572
H Letters written	6,3	14 955	5,8	24 790
I Reports written	6,9	4 495	3,8	5 242
J2 Designing (pipelines)	-	-	5,1	3 678
J3 Designing (other)	7,1	3 365	16,4	13 811

Farmers' days organised	366
Demonstrations held	316
Properties inspected for weeds	6 962
Weed notices served	227
Farming competitions held	102
Number of participants involved in competitions	900
Number of study groups	290
Number of study group members	3 257
Number of meetings held	1 100
Number of programme planning committees	134
Number of farmers involved as members	957

PUBLICATIONS

POPULAR PUBLICATIONS

A total of 340 new pamphlets with a combined printing of more than 1 075 000 copies were published. In addition 132 pamphlets were reprinted with a total printing of 292 000 copies. The pamphlets again cover a wide range of subjects on the cultivation of various field crops, vegetables, deciduous fruit, citrus and subtropical fruits, the production of wine grapes, beef cattle production, wool production, poultry, pig farming, engineering aspects and flowers.

All the automatic addressing and insertion equipment for pamphlets and publications has been purchased and installed, and various series, such as those on wool production, wheat, potatoes, apples, maize and stone-fruit, have already been distributed together with plastic covers. A determination of the needs of the various Departmental offices has also been completed and the pamphlets sent as requested.

Satisfactory progress is being made with the input of addresses in accordance with particular programmes and systems, and more than 35 000 addresses have been computerised.

Apart from the pamphlets, 153 000 copies of the weekly newsletter *Agricultural News* were printed and distributed, as well as 207 930 copies of other newsletters, 46 280 agricultural reports, 79 900 copies of farmers' day lectures, library lists, manuals, brochures and commentaries for slide series and 118 750 copies of test reports on the Milk Recording Scheme and egg production tests, as well as on assembled mowers, granular-herbicide applicators, fertiliser distributors, mouldboard ploughs and cattle scales.

Two issues of the publication on the recommendations and correct use of pesticides and fungicides were published, as well as one issue of *Agricultural Research*, one publication on the control of insect pests in stored products, one on the control of tuberculosis among cattle and one on the vaccines from Onderstepoort. A total of 28 260 copies of pamphlets and periodicals were sold.

In co-operation with the Department of Information and the Department of Agricultural Economics and Marketing a prestige publication, *Agriculture in South Africa*, was prepared and privately issued in both languages. The overseas distribution of this publication elicited a very favourable response.

On behalf of the Department of Agricultural Economics and Marketing, the Departmental Annual Report (1974/75), two issues of *Trends in the Agricultural Sector* and four issues of *Agrekon* and the Report of the Commission of Inquiry into the Marketing Act, as well as four papers, were prepared in both languages.

SCIENTIFIC PUBLICATIONS

Agroplantae, Agroanimalia, Agrochemophysica, Phytophyllactica

During the year 128 articles (90 English and 38 Afrikaans) were received, which is 12 more than in the previous year. Together with a carry-over of 93 articles from the previous year, 221 articles were dealt with. Of these 112 were approved, 87 of which were published, 11 rejected and 16 cancelled, while 1 was combined with another article and 81 are still under consideration.

No serious problems were experienced in issuing the periodicals in time. Only the March 1976 issue of all four the periodicals was published about two months late, the delay being occasioned by essential colour work.

Onderstepoort Journal of Veterinary Research

Three issues of this journal, Volume 42(3), 42(4) and 43(1) appeared during the year. A total of 22 contributions were received and consequently, with a carry-over of 4 articles, 26 articles were dealt with. Of these, 11 were published and the other 15

are already with the printer and form part of Volume 43(2) and Volume 43(3).

Other scientific publications

Other scientific publications brought out were the following: *Flowering Plants of Africa* Volume 43, parts 3 and 4; *Flora of Southern Africa* Volume 16, part 1; *Genera of Southern African Flowering Plants* Volume 1.

Two issues of the journal *Forestry in South Africa*, Nos. 16 and 17, were prepared for printing on behalf of the Department of Forestry. Publication of the journal was ceased during the year under review. Although the articles will be published in a non-departmental journal in future, they are still being prepared by this Department. During the year under review 12 articles were edited for publication in this journal.

AUDIO-VISUAL SERVICES

During the year 10 synchronised slide series were completed, while a further 86 series are in various stages of completion. The use of the slide programmes as a method of presenting information visually is enjoying increasing popularity. The various series were lent out 187 times during the year, which is almost twice as many times as the total since 1971/72, while they have been distributed on a permanent basis 91 times, which is about three times as many as the total since 1971/72. Two programmes which have been issued to the Botanical Research Institute, for example, have been shown to more than 3 500 members of the public during the past three years.

Assistance was again given to several organisations in the presentation of slide programmes, lectures and demonstrations as well as in the design and preparation of display material. Active assistance was in some cases given in the mounting and judging of displays.

Assistance was also given to the Department of Information in obtaining and sending flowers to several overseas international exhibitions. This made a positive contribution to the Republic's image abroad and several prizes were won, one prize being specifically for the exceptional quality of the flowers.

A highlight of the year's activities was the part the Department took in both the planning of and the arrangements for the first International Food and Allied Expo presented in the Republic.

A film entitled *Food is Life*, made in co-operation with the National Film Board, was released during the Expo and distributed throughout the country afterwards. Almost 3 000 slides were also taken and public address systems as well as a variety of other services were rendered in connection with the Expo programme.

NEWS SERVICE

During the year under review requests were received from Organised Agriculture for *Agricultural News* to be distributed more widely among farming leaders. The requests are being met within the framework of the Department's policy to expand the circulation of the newsletter on a selective basis. The current weekly issue amounts to 3 000 copies.

Apart from *Agricultural News* and an enquiry service, the news service took care of the daily radio news bulletin as well as all press and radio statements, and news and speech releases.

CALLING ALL FARMERS

One of the most important objectives of *Calling All Farmers* was achieved during the year under review when 132 farmers were introduced to listeners during 200 broadcasts. In many cases the farmers were featured with extension officers and other agriculturists.

The radio was involved in two important publicity campaigns. A short series of talks from a publication on the use of Onderstepoort vaccines elicited an exceptional response and two issues of 3 000 copies each of this publication were distributed free of charge. Reports, talks and interviews on the control of Nassella tussock grass are being continued in support of the Department's campaign against this dangerous weed.

Regular publicity for the Department's pamphlet service has stimulated the demand for pamphlets. Valuable co-operation in the supply of broadcast material is still being received from sister departments.

A special word of thanks is due to the SABC in particular for its cordial co-operation and accurate treatment of agricultural matters in a wide spectrum of programmes.

CENTRAL AGRICULTURAL LIBRARY

The library has continued its publicity programme, particularly in respect of radio talks and exhibitions. An exhibition was held at Bien Donné on the occasion of a farmers' day in November 1975. The library also played an active part in the International Food and Allied Expo. Display material was collected from booksellers, the control boards and other institutions. Library staff supervised the displays and also recruited about 75 new members.

The change-over to budgeting by objectives had a considerable effect on the library. The placing of orders was decentralised and nearly all the branch libraries are now themselves responsible for their orders.

Because of the big staff turnover no new services could be introduced. It was nevertheless possible to expand and improve existing services. Consequently the loan service increased tremendously. Whereas an average of 570 books

and 370 pamphlets per month were loaned during 1974/75, the loan figures rose to an average of 1 500 books and 1 300 pamphlets per month in 1975/76. A fair amount of reorganisation was done to improve the appearance of the library and to use available space more effectively.

All the branch libraries were visited and the smaller offices in particular received attention. Some research stations and veterinary offices were visited, and a two-day course for officers from these offices was presented. Interest in them was, however, disappointing.

The stock of periodicals was expanded by subscribing to a large number of series in foreign

languages, mainly German and French periodicals with English summaries. At the same time the periodical catalogue was revised and supplemented and the library's entries in the national periodical list, PISAL, were brought up to date.

Satisfactory progress was also made with the revision of the scheme for the exchange of publications with other countries.

Publications are sent free of charge only if another publication is received in return. Several free consignments were discontinued in cases where the institution concerned did not fulfil its part of the contract.

3. Natural Resources

MAPPING OF LAND TYPES

About three-quarters of the fieldwork for the 1:250 000 land type map of South Africa is complete. A land type denotes land with a marked degree of uniformity with respect to terrain form, soil pattern and macroclimate.

The fieldwork for the 1:50 000 soil survey of the Pretoria-Witwatersrand-Vereeniging and the Cape Town-Saldanha-Montagu areas is three-fifths and one-fifth complete, respectively.

Detailed (9 350 ha) and reconnaissance (186 000 ha) soil surveys were carried out as an aid to the planning of irrigation development.

During the year under review the physical classification of 158 000 ha of agricultural land was done in the Transvaal Region. This classification was done strictly according to the binomial system of classification, i.e. according to soil form, series, effective depth and yield potential. Physical limitations were determined for each type of soil on every farm.

A total of 307 000 ha has now been classified. This classification has been done in ten target areas in the Transvaal Region.

AGRICULTURAL METEOROLOGY

Climatic surveys yielding data for solving various agricultural problems were continued in the various regions. The number of agricultural weather stations remained more or less constant, except in the maize producing areas of the Transvaal and Natal where there was a slow increase in the number of observation points.

DATA PROCESSING

The digitising of data or thermo-hygrograph maps by means of electronic digitisers was continued at Stellenbosch, while a new system was begun at the Soil and Irrigation Research Institute in Pretoria. This system, which consists of a table-top computer, printer and digitiser (with platen), can place digitised data on cassette tapes and also serves as a terminal for the Department's computer. Very good results and a great saving in time and labour, especially as far as checking was concerned, were achieved with this system.

The recording and correcting on punch cards of daily evaporation figures from the Department of Water Affairs' records has been completed. A detailed analysis has been made of all data available at the Weather Bureau. This information

is now being transferred on to charts and bar diagrams, which may be supplied for information purposes to officials.

During the year under review the various agricultural meteorology sections became more au fait with the computer terminals supplied locally.

AGROCLIMATE

The analysis of monthly evaporation data, together with similar figures for rainfall and temperature, was continued. It was generally found that evaporation decreases as altitude increases. Thus far no suitable method has been devised for the meaningful mapping of existing evaporation data.

The appointment of a climatologist from the USA marked the beginning of a study of the literature relating to computer cartography with a view to applying the findings to agricultural climatology, especially as regards the effect of slope and aspect, i.e. terrain or topo-climatology. A key programme with accompanying projects was compiled for field crops in the summer rainfall area.

EVAPOTRANSPIRATION

During the year under review the young pear trees in tubs were replaced by the same cultivar planted in the surrounding orchard. A provisional A-pan factor has been determined for these pear trees (no tillage) which varies from 0,23 to 0,54.

WIND STUDIES

Surveys of wind speed and direction as well as wind damage to citrus were continued during the year. The pattern of wind incidence, especially in respect of direction, is relatively well known at this stage. The number of observation points could therefore possibly be reduced in the near future.

A plastic material known as Netlon was tested during the year under review, and its effectiveness as a windbreak as well as that of 13 mm wire netting is shown in Table 1 on the next page.

The survey of wind and other factors on the site of the Theewaterskloof Dam was continued.

PLANT/CLIMATE RELATIONSHIP

In experimental work to investigate the influence of weather factors on the picking dates of apples, the results again showed that in the past picking dates were one to two weeks too early for the optimum stage of ripeness. A new formula is

TABLE 1 - The percentage reduction in wind speed in front of and behind the windbreak

Distance from windbreak	+4H	+2H	-2H	-4H	-6H	-8H	-10H	-12H
Wire netting	6	7	9	9	8	8	7	6
Netlon	5	9	35	31	25	19	14	10

H=height of windbreak in m

being developed which will be based on the use of full-bloom dates and the sum of photothermic units.

Progress has been made in the search for a suitable relationship between temperatures and the development of pineapples, especially in the period between flowering and harvesting. Reliable data have, however, not been available long enough to make it possible to arrive at a satisfactory solution to the problem.

Investigation into the effect of climate on the development of cotton plants were continued at the Loskop, Vaalharts and Upington Research Stations. Experience has shown that special care has to be taken when recording phenological data at Upington (because of unusually vigorous growth), and a temporary worker was stationed there during the summer months to be responsible solely for these records, from which it will therefore be possible to arrive at more reliable conclusions.

In Natal the mathematical model of the development of a maize crop has been brought to the stage where, it is hoped, it will shortly be possible to use it as a climatic index for mapping purposes.

With the computer terminal now available at Potchefstroom, daily meteorological data have been computerised, making it possible to calculate the moisture supply potential for maize and wheat.

Data obtained in trials with green peas have been analysed. Several promising relationships were found to exist between the development of pea plants and temperature. The results obtained indicate that, with the aid of temperature data, it should be possible to estimate the length of the growing season of peas accurately enough for use in mapping.

In trials at Grootfontein, where the effects of the climate on the composition of vegetation were studied, the effects of the summer and autumn rains of the past favourable seasons could be seen in the extremely good development of grass.

IRRIGATION PLANNING

Various matters relating to irrigation development are the responsibility of the Irrigation Planning Subdivision of the Soil and Irrigation Research Institute. This function being multi-disciplinary, the Subdivision co-operated closely with institutes, regions and divisions, as well as other departments, during the year under review.

Large-scale irrigation potential determinations with a view to irrigation development were carried out for the following areas: Douglas, Nuy-Ashton, Winterton, Enon-Coerney and Venterstad. In these

studies the selection of land for irrigation development was based on an interpretation of the physical factors (climate, soil, site morphology and drainage) and their integration with production-economic characteristics.

These results were used in cost-benefit analyses by means of which the viability of a project was assessed. Potentially, about 28 000 ha were classified as net irrigable land, with a theoretical net farming income in the vicinity of R8 million.

The replanning of Government properties in the Great Fish River Valley took a long time. On the basis of physical and economic specifications as well as other set limitations which applied specifically to this study, the 109 properties were consolidated or divided into 48 economic units. In respect of the remaining portions (55) it was recommended that they be advertised as being uneconomical and be inalienably consolidated with neighbouring farms on merit. Owing to the absence of a *carte blanche* and the fact that the extent of classes of land suitable for irrigation varies from farm to farm, it was impossible to create equivalent farm units. Inventories of each farm unit were duly compiled and appraisers used a relative monetary value based on the entrepreneur's return as their criterion in estimating the purchase price of each farm realistically.

Also of importance is the processing of information on irrigation and the compiling of a map (scale 1:1 000 000) showing the incidence of irrigation in the Republic and a map (scale 1:1 500 000) showing the location of all Government water schemes and irrigation board schemes.

IRRIGATION RESEARCH

Soil moisture consumption by crops is being monitored at various points in the Transvaal and OFS using tensiometers and neutron soil moisture measuring equipment. The results will throw light on the relationship between crop yield and water use and provide a good indication of the efficiency of agricultural water use under practical growing conditions.

Fundamental studies of the movement and role of water in the soil-plant-atmosphere system are on the point of commencing as a result of continuing development of the weighing lysimeter complex at Roodeplaat. An electronic data logger, capable of capturing some 60 channels of data on magnetic tape in digital form, has been installed and four weighing lysimeters coupled to the system.

This means that a continuous record of mass changes due to crop evapotranspiration may be

kept with an accuracy better than the mass equivalent of 0,05 mm of water.

The lysimeter studies on evapotranspiration of citrus trees in the Sundays River Valley have been extended to observe and predict the effects of poor quality irrigation water in the movement and accumulation of salts in the soils under irrigation.

With the aid of soil chemical and physical data in a brack reclamation model on computer, recommendations are at present being made for the Oudtshoorn area through the Extension Office on improved reclamation and irrigation techniques. A model predicting moisture distribution under drip irrigation was also tested. Similarities between theoretical and observed moisture distribution point to the usefulness of this technique.

SOIL FERTILITY STUDIES

The Soil and Irrigation Research Institute undertakes the co-ordination of and research into fertilising advisory services to farmers.

In May 1976 discussions took place between departmental bodies and the private sector on the revision of the registered series of fertiliser mixtures as defined in Act 36 of 1947. Good progress was made in a survey of the soil fertility status of the Republic's soils in general, as well as in the comparison of methods that can be used to evaluate available nutrients.

A start was also made on the testing and development of new techniques and methods of predicting the availability of plant nutrients in soils.

Good progress has been made in the development of an implement for the introduction of lime and other fertilisers into the subsoil of established orchards. For this purpose a jet of air is used to blast the fertiliser into the soil. The development process has gone through various phases and an implement has now been designed in which a sulphur blower and subsoiler are attached to the same tractor so that the sulphur blower supplies the air-jet by which the lime is forced through a plastic tube to the outlet (in the form of a slit) at the rear of the subsoiler and thence into the subsoil.

To prevent soil from caving in behind the outlet during this process and thus hampering the distribution of the fertiliser being applied, a metal plate is attached to the subsoiler so that during tilling it runs about 100 mm below the surface of the soil. A metal plate is also attached to the outlet to spread the air-jet.

Further work is, however, still needed to improve the distribution of the fertiliser being applied.

The maintenance of a favourable level of soil acidity is essential to the stabilisation of farming in the southern coastal area. 560 soil samples were taken from this area and analysed for this purpose, and it was found that lime applications were needed in 74 per cent of the cases to ensure optimum yields from legume pastures.

Even with wheat, which is far more acid-tolerant, 15 per cent of the samples showed a lime shortage.

From this study it also emerged that low phosphorus content is an important problem which sometimes results in the potential of artificial pastures not being fully realised.

OTHER SOIL AND WATER STUDIES

A detailed chemical and mineralogical soil analysis programme is being carried out on samples of selected soil profiles derived from representative soil series from the various areas in the country. During the past year more than 600 samples were chemically analysed, so that to date 2 500 analyses have been completed, representing about 80 per cent of the planned programme. These data are at present being computerised so that relationships between the various characteristics, as well as the variations within the various soil series, can be determined.

Although the mineralogical side of the programme entails an enormous amount of work, good progress has nevertheless been made.

The project undertaken by the Soil and Irrigation Research Institute in collaboration with the CSIR in an attempt to evaluate the role of irrigation practices and water quality in the salinisation of the water of the Great Fish River was continued. The mathematical model to be used has been computerised and tested using control data. The great variety of soil types has been grouped into so-called "modelling soil units" on the basis of their morphological characteristics.

A start has also been made on drawing a map showing the distribution of "modelling soil units" in the irrigated area. For this purpose information from the intensive soil survey made in 1973 was used. Such chemical and other soil analyses as are necessary for the model are done on a series of soil samples representative of the "modelling soil unit". The model is expected to be tested for the first time next year on part of the irrigated area.

During the year under review 90 water samples from the Karoo Region were analysed to determine their suitability for irrigation purposes. This is a big increase on the number analysed in the past. The general tendency among farmers in this region is first to determine the quality of a water source before incurring any further expenses in developing the source. This is a very desirable trend because it eliminates problems of salinisation and poor crops that may arise afterwards.

ANALYTICAL SERVICES

Inspectors took 1 277 specimens from stock feed manufacturers, mills, fertiliser manufacturers, agricultural lime quarries and agricultural stock remedy manufacturers in accordance with the

provisions of Act 36 of 1947 and analysed these in the laboratories of the Soil and Irrigation Research Institute.

About 97 per cent of these samples complied with the prescribed requirements.

The soil and Irrigation Research Institute analysed 1 639 plant samples, 617 water samples and 9 365 soil samples for Departmental institutes and regions, semi-Government organisations and private bodies and made at least 96 389 determinations.

USE OF FERTILISERS

During the year under review 2 738 435 metric tons of fertilisers were used in the cultivation of agricultural crops. This quantity includes 295 880 tons of nitrogen, 159 157 tons of phosphorus and 113 719 tons of potassium. There was an increase of 8,3 per cent on the figure for the previous year.

To counteract soil acidity, 1 087 236 tons of agricultural lime was used.

SOIL CONSERVATION

The exceptionally high rainfall of the past year and the accompanying floods again focussed attention on our soil's vulnerability to erosion. Despite the application of the Soil Conservation Act and the ample financial aid and technical and professional assistance provided by the Government, as well as efforts by farmers themselves, the conservation and protection of the soil still leave much to be desired.

There is a definite backlog as regards the erection of conservation works and the application of conservation practices, and it is expected that it will take several years more before the decline can be finally arrested.

APPLICATION OF THE SOIL CONSERVATION ACT

The regional organisations and the Department's Division of Soil Protection are

co-responsible for promoting the objectives of the Soil Conservation Act, but since the regions have to depend on persuasion alone, it is the task of the Division of Soil Protection to take disciplinary and legal action under the Act. Unless the concerted extension effort by the regions succeeds in inducing landowners to organise their enterprises in such a way that the natural resources are not harmed, the Division of Soil Protection must intervene.

From the commencement of the amended Soil Conservation Act in 1969 up to 30 June 1976, the Division of Soil Protection dealt with 8 647 possible problem cases, served 430 directions relating to 178 farms and handed over 39 cases of contravention of directions to the Attorney General, 24 of which led to prosecutions. Twenty-two of the offenders were found guilty and two not guilty. Five court cases are still pending.

There are at present 1 705 farms which are receiving the attention of the Division of Soil Protection, but it is expected that the malpractices on about 90 per cent of these farms will be rectified without personal directions being served.

Tables 2 and 3 reflect disciplinary action against farmers in the various regions of the Republic and South-West Africa by the Division of Soil Protection up to and including 30 June 1976.

SOIL CONSERVATION COMMITTEES

Soil conservation committees still play an important role in the Department's efforts to achieve the objects of the Soil Conservation Act. In some regions the committees' programmes of work are closely linked to those of the extension service, but there are other committees that continue on their own without making much progress.

The Department is at present investigating the activities of these committees and it is expected that the report of the committee of inquiry, with recommendations, will be published during the next year.



A well-made half broad-base contour bank on a farm in the district of Boston, Natal. Farmers are being assisted in a campaign to promote the protection of cultivated land



A stretch of marshy land, formerly arid and with a tendency to form waterpans, was planted with prickly pears and old-man saltbush. This resulted in good recovery of the veld and an abundance of grazing. The photograph was taken in the district of Jansenville

TABLE 2 - Number of farms with suspected offences

Office	Carried over from previous year	Added during year under review	Dealt with during year under review	Total not dealt with
Highveld	77	24	8	93
Karoo	350	6	25	331
Natal	222	46	9	259
Eastern Cape	188	71	115	144
Free State	303	67	198	172
Transvaal	272	43	70	245
Winter Rainfall	250	66	45	271
South-West Africa	190	7	7	190
Total	1 852	330	477	1 705

TABLE 3 - Number of farms with directions served

Office	Carried over from previous year	Added during year under review	Dealt with during year under review	Total not dealt with
Highveld	17	0	1	16
Karoo	23	0	3	20
Natal	16	0	0	16
Eastern Cape	18	0	1	17
Free State	11	1	0	12
Transvaal	33	0	1	32
Winter Rainfall	18	0	0	18
South-West Africa	0	0	0	0
Total	136	1	6	131

REGIONAL ADVISORY COMMITTEES

Most regional advisory committees meet once a year. At these meetings the progress, or otherwise, regarding optimum soil utilisation in the regions concerned is discussed and recommendations are made for action by soil conservation committees and regional organisations. Although most regional advisory committees play a passive role the discussions, the reporting done and the exchange of information at meetings are nevertheless of great value to the Department and the soil conservation committees.

The work done by the regional advisory committees also serves as a stimulus to the Soil Protection Advisory Board.

SOIL PROTECTION ADVISORY BOARD

The Soil Protection Advisory Board represents all the regions in the Republic and South-West Africa as well as the South African Agricultural Union, with the result that the Department is well informed and advised regarding soil conservation and related matters.

The Board made the following recommendations during the year under review:

- (a) The 19 corridor farms in Namaqualand must be withdrawn for an indefinite period and the local Soil Conservation Committee must from time to time submit progress reports on the

condition of the veld in consultation with the Extension Officer. After the complete recovery of the corridor farms the reallocation of the area to farmers may be considered, i.e. after consolidation of uneconomic units into viable farming units.

- (b) The Soil Protection Advisory Board notes with concern that several small pieces of land have been allocated to farmers at Pongola. This practice of carving up agricultural land is contrary to Departmental policy. The Board feels that there should be better liaison between the Government Departments concerned before allocations of this nature are made.
- (c) The Board requests that the Department undertake research so that conclusive answers can be given to the following questions:
 - (i) the influence of rainfall of varying intensities on different types of soil,
 - (ii) yearly soil losses as result of water erosion under various circumstances,
 - (iii) yearly soil formation,
 - (iv) the effectiveness of the contour standards applied,
 - (v) cultivation methods to combat erosion,
 - (vi) the breeding of crops capable of adapting to contour cultivation.
- (d) Bush encroachment and bush which is becoming dense are a serious problem, and the Board believes that spraying is the only effective way of combating bush encroachment. If trials now in progress show promise, serious attention will have to be given to the possible subsidisation of spray.
- (e) A body must be established within the Department to keep a register of all research results and also of research currently being undertaken on soil protection.
- (f) The Board also expressed concern at the large area of high-potential agricultural land being used for non-agricultural purposes, and noted with appreciation the Cabinet's decision that -
 - (i) the retention of good agricultural land should be treated as a matter of national importance;
 - (ii) the Department of Agricultural Technical Services will identify good agricultural land as a matter of priority; and
 - (iii) the Department of Planning and the Environment and all other planning bodies must, within the framework of their functions, endeavour as far as possible to retain the land thus designated for agriculture.

FINANCIAL AID SCHEMES UNDER THE SOIL CONSERVATION ACT

As can be seen from Tables 4 and 5, the subsidies on completed soil conservation works increased by

about 20 per cent. However, taking into account that the subsidy on fences was increased by 42 per cent from 1 April 1975, it must be accepted that for subsidy purposes the extent of the soil conservation works erected during the year did not differ appreciably from that for the previous year.

Grants for flood repairs increased drastically. Expenditure on flood repairs for the past year was higher than for the whole period from 1948 to 1974. Expenditure in respect of the Stock Reduction Scheme decreased because many participants completed the contract period of five years or withdrew from the Scheme because of the improvement of their veld or the sale of their land.

It should be noted that, although the Stock Reduction Scheme only commenced in 1970, more has been spent on this Scheme than on soil conservation works since 1948 (State works excluded).

In South-West Africa the expenditure on subsidies and grants under the Stock Reduction Scheme remained fairly constant. By far the greatest part of the subsidies paid out in South-West Africa is used for the erection of fences and stock-watering points.

STATE WORKS

The erection of soil conservation works at key points in lowlands where erosion has set in, systematically follows the generally accepted run-off control planning of catchment areas.

The progress made is summarised in Table 6 on the next page.

As can be seen from the table, much repair work was again necessary in the Vlekpoort area. This is the oldest work, and it is now giving rise to problems which were not originally foreseen.

The sediment and vegetal cover above the structures build up to a level where it is not always possible for all the floodwater to flow through the outlets, with the result that the earth bank structures are damaged. This is caused by a basic defect in the design of many of the first works, which was fortunately rectified at an early stage.

SOIL CONSERVATION RESEARCH

Research by the Division of Agricultural Engineering during the year under review confirmed the following:

- In a year of exceptionally heavy rainfall and record floods, the common reed again proved to be highly resistant to washing away once it is properly established. Spanish reed is less suitable where high flood velocities occur, but is useful under favourable conditions.
- Secondary structures, especially low concrete structures in watercourses, which help to deposit sediment over long distances in watercourses and on which reeds can be grown, perform a very important conservation function.
- The past year's information again confirmed that bare patches and sparsely covered veld

TABLE 4 - Subsidies and grants paid out under the Soil Conservation Act

Period	Subsidies on completed soil conservation works	Flood Repair Scheme	Stock Reduction Scheme	Veld Reclamation Scheme*	Grass Ley Crop Scheme*
1948/70	20 973 154	103 516	-	2 124 563	287 299
1970/71	2 967 684	599	611 853	553 675	11 849
1971/72	3 023 651	2 219	7 906 502	366 542	13 000
1972/73	2 707 267	10 161	10 713 940	210 468	15 684
1973/74	2 567 339	8 674	9 046 140	43 976	7 688
1974/75	2 976 393	1 132	8 171 637	486	2 824
1975/76	3 591 150	158 680	6 354 693	-	200
Total	38 806 638	284 981	42 804 765	3 299 710	338 544

*The Veld Reclamation and Grass Ley Crop Schemes have already been concluded

TABLE 5 - Subsidies and grants paid out under the Soil Conservation Act for South-West Africa

Period	Subsidies on completed soil conservation works	Flood Repair Scheme grants	Stock reduction Scheme grants
1971/72	1 019 143	-	321 900
1972/73	1 532 137	-	1 057 607
1973/74	1 965 943	-	1 292 931
1974/75	2 017 586	345	1 143 537
1975/76	2 179 683	1 693	1 001 383
Total	8 716 492	2 038	4 817 358

THE SUBDIVISION OF AGRICULTURAL LAND ACT

After an increase of 15 per cent in 1974/75, the number of applications dropped by 18 per cent to 1 029 during the past year.

Since the amendment of the Act in 1972 the registration of certain servitudes and leases has also been subject to approval under the Act and it is now possible to give particulars on these applications (Table 1(b)).

TABLE 6 - Progress with State Works

Catchment area	New works completed Number	Value	Repairs completed Number	Value
Modderbultspruit	2	83 100		
Brakrivier			1	37 000
Vlekpoort River			13	52 400
Riet River			2	13 600
Palmietsspruit	1	64 460		
Slikspruit	1	21 690		
Fish River			1	39 100
Bossieslaagte	3	58 203	1	11 293
Wintershoek	1	129 608		
Nuwejaarspruit			1	7 260
Sand River	3	257 538		
Vaal River			1	6 229
Total 1975/1976	11	614 599	20	166 882
Total 1974/75	17	463 137	25	217 830
Total 1973/74	8	451 529	15	85 300
Total 1972/73	3	765 759	17	149 317
Total 1971/72	9	401 071	9	115 979

TABLE 1 - Number of applications dealt with under the Act, 2.1.71 to 30.6.76

1(a) Applications for subdivision, vesting of undivided shares, township development and incorporation into the areas of jurisdiction of municipal and similar bodies

Period	Approvals		Rejections		Total
	Number	%	Number	%	
2.1.1971/30.6.1971	331	67	158	33	489
1.7.1971/30.6.1972	725	74	252	26	977
1.7.1972/30.6.1973	659	81	157	19	816
1.7.1973/30.6.1974	715	74	253	26	968
1.7.1974/30.6.1975	848	74	294	26	1 142
1.7.1975/30.6.1976	738	76	239	24	977
Total	4 016	75	1 353	25	5 369

1(b) Applications in respect of leases and servitudes

Period	Approvals		Rejections		Total
	Number	%	Number	%	
1.7.1972/30.6.1973	72	98.6	1	1.4	73
1.7.1973/30.6.1974	92	98	2	2	94
1.7.1974/30.6.1975	68	89	8	11	76
1.7.1975/30.6.1976	49	94	3	6	52
Total	281	95	14	5	295

can be effectively reclaimed by means of a grass covering.

- Where treated-pole jacks were used much heavier floods than usual occurred, and even under these circumstances the results were generally very satisfactory.
- The necessary care of areas above soil conservation structures results in an appreciable improvement in stabilisation and in the sediment slopes of such areas. This trend of continuous improvement in sediment slopes is so important that it will be incorporated in the prediction curve for sediment slopes.
- Processed data on sediment slopes, which were again collected at many places, will be used to compile a new handbook on the subject.

The pattern of approved and rejected applications in Table 1(a) is reasonably constant, namely 75 per cent approvals and 25 per cent rejections. The percentage of applications approved could have been appreciably higher had it not been for a large number of applications in terms of testamentary dispositions which were contrary to the objectives of the Act. This shows that when drawing up wills many land owners do not first establish whether their proposals will be approved.

SUBDIVISION FOR AGRICULTURAL PURPOSES

Of the 977 applications mentioned in Table I(a) which were received during the past year, 746, i.e. 76%, were for agricultural purposes only. Of these 746 applications, 170 or 23 per cent were rejected. An analysis of the statistics shows that the application of the Act is not merely a preventative measure, but that it has a wider impact because in many cases it results in undersized units being consolidated into larger ones, and it also eliminates shareholding, which is undesirable from an agricultural point of view.

TABLE 2 - Number of farm units created and number and area consolidated with other land, 2.1.71 to 3.6.76

Period	New farm units created	Consolidation	
		Number of farm units	Area (ha)
2.1.1971/30.6.1971	233	116	48 951
1.7.1971/30.6.1972	152	436	108 799
1.7.1972/30.6.1973	134	342	88 178
1.7.1973/30.6.1974	116	503	164 358
1.7.1974/30.6.1975	158	523	174 203
1.7.1975/30.6.1976	61	385	173 122
Total	854	2 305	757 611

Approval for the creation of new units and for the transfer of agricultural land to the names of more owners inevitably results in an increase in the number of owners. Nevertheless, the statistics show that the number of owners during this period decreased by 728 as a result of the consolidation of properties and other conditions stipulated. In the process, 385 farm units which did not meet the minimum requirements for farm size also disappeared.

This brings the total since 2 January 1971 to 2 305, involving 757 611 ha. By contrast, only 61 new units came into existence and the figure for the whole period was only 854.

The position is therefore that a high percentage of the applications submitted are concerned merely with the conversion of existing properties into new units, which often results in a reduction in the number of units. For every two applications for subdivision which were approved during the past year, one farm unit disappeared through consolidation.

SUBDIVISION OF AGRICULTURAL LAND FOR NON-AGRICULTURAL PURPOSES

The number of applications for subdivision for non-agricultural purposes decreased appreciably during the past year. Many of the applications which were rejected were for extensive residential purposes.

In Table 3 the applications for subdivision for non-agricultural purposes are divided into two groups, namely-



An eroded vlei in the district of Windhoek that was reclaimed by means of blue buffel grass

- (i) applications for extensive residential purposes, commercial purposes, resorts, and mining activities; and
- (ii) intensive urban use.

The area involved in the applications in Table 3, column (i) also showed a sharp decrease compared with previous years. By contrast, the area relinquished for intensive urban use was the biggest since the commencement of the Act, namely 16 756 ha. About two thirds of this area (11 614 ha) is involved in development of, and obtaining greater control over existing development at, four centres only, namely Secunda, Durban, Queenstown and Rosslyn. The remaining 71 approvals therefore involve only 4 962 ha.

To the land indicated above which is used for non-agricultural purposes must be added that used for roads, railway lines, airports and mining activities, where no subdivision is involved. During the past year considerable progress was made, particularly in enlisting the co-operation of roads authorities in the construction of new roads and the re-routing of existing roads.

The amount of land which is lost to agriculture as a result of mining activities, especially where the open-cast method is used, remains a source of concern.

NATURAL GRAZING

Rainfall was above average in almost all the Regions. As a result veld recovery was good, especially in respect of the grass cover, but unfortunately this brought its own problems in certain cases.

The effect of the favourable conditions on veld production is clearly reflected by the biomass studies carried out in the Karoo Region. At

TABLE 3 - Subdivision for non-agricultural purposes - number of applications and area involved

Period	(i) Extensive residential, commercial and other purposes						(ii) Intensive urban use					
	Approved			Rejected			Approved			Rejected		
	Number	%	ha	Number	%	ha	Number	%	ha	Number	%	ha
2.1.71/30.6.71	74	54	2 612	65	46	7 244	11	92	1 426	1	8	66
1.7.71/30.6.72	129	56	2 825	100	44	8 259	29	97	1 152	1	3	13
1.7.72/30.6.73	91	63	3 879	53	37	3 998	74	94	10 763	5	6	1 338
1.7.73/30.6.74	105	50	3 361	103	50	6 975	90	98	8 133	2	2	432
1.7.74/30.6.75	86	43	3 706	113	57	5 700	97	95	13 751	15	5	3 296
1.7.75/30.6.76	75	54	2 248	63	46	2 704	75	90	16 576	8	10	868
Total	485	53	18 651	497	47	34 880	376	92	41 801	32	8	6 013

Grootfontein biomasses of 6 190 kg/ha on grassveld and 4 790 kg/ha on brushland were measured. At Carnarvon, which has a fairly low average rainfall, up to 4 621 kg/ha was obtained.

Notwithstanding the favourable veld conditions and the large quantity of plant material available, the conditions of the stock, especially the sheep, was poor. The nutritional value of the grassveld at the dry stage appeared to be inadequate and problems were also experienced as a result of abnormally high parasite infestations.

Many farmers do not have the necessary physical facilities (e.g. sufficient camps and an adequate water supply) to apply sound veld control measures consistently.

At the Potchefstroom Experimental Farm, on the other hand, Simmentaler and Africander herds maintained extremely satisfactory mass increases in a system of controlled selective grazing (Soutpan system), even on mature veld. Simmentaler calves achieved a daily mass increase of 1 kg on this veld over a period of 168 days.

The abnormal rainfall conditions resulted in large areas of veld on the Ghaap Plateau becoming waterlogged. Climax species were not as badly affected as pioneer species.

VELD FIRES

The danger of accidental fires increased as a result of the favourable conditions. In the OFS Region 274 883 ha was destroyed by veld fires and at least 30 000 ha was destroyed in the Karoo Region.

PRODUCTION SYSTEMS

The production system projects in progress at the Gellap-Ost and Kalahari Experimental Farms in SWA indicated that a stocking rate adjustment can be fairly accurately made with the aid of yield determinations arrived at by cutting randomised blocks. This method of measuring the permissible grazing yield from year to year, and determining the carrying capacity accordingly, is also applied by two soil conservation committees.

Research in the Valley bushveld area of the Eastern Cape has shown that a period of rest from March to March is better for the veld than a 12 months' rest starting at any other time of the year. Although this veld type has a total biomass of 55 000 kg of wet matter per ha, only 1 200 kg per ha a year is really available for animal production.

Despite the low production no quality problems are experienced and a high level of animal production can be maintained.

Trials at the Nortier Experimental Farm showed that West Coast strandveld is very sensitive to grazing during the latter part of the growing season, viz August to October.

NUTRITIONAL VALUE

Studies to determine feed intake under grazing conditions are in progress at several localities. At Glen an investigation into the feed intake of Africander cows which calved in December revealed that the crude protein provided by the grazing was adequate right up to June. On the other hand, by May the grazing was no longer able to supply the energy requirements of lactating cows.

On Döhne sourveld it was found that cattle have a specific order of preference among species and take in food according to a fixed grazing pattern. The order of preference among species and grazing pattern are not changed by an increase in the grazing pressure.

FERTILISING THE VELD

A fertilising trial on veld in the Highveld Region revealed that a good dry matter yield can be obtained on soil with a P content as low as 4 ppm, provided a balanced dressing of nitrogen and phosphorus (approximately in the ratio of 8N:1P) is given. It also appears that the combination of a high P dressing and a high N dressing is responsible for red grass *Themeda triandra* disappearing from the veld composition.

At Bethlehem an increase of 38 per cent in milk production was obtained on veld fertilised with 5 kg of P and 50 kg of N per ha in comparison with milk production from unfertilised veld.

CATTLE:GOAT RATIOS

In a trial at the Messina Experimental Farm the effect of running cattle and Boer goats, separately and together, on Mopani veld was determined. In the goat camps it was found that about 78,8 per cent of the leaves of bushes below the grazing line of 2 metres had been utilised; the corresponding figures were 59,0 per cent for the camps containing cattle and goats and 40,9 per cent

for the cattle camps. After six years the quantity of leaves within the reach of the goats in the goat camps was probably inadequate for optimum production. The following conclusions were drawn from this trial:

1. On Mopani veld with a poor cover of annual grasses the Boer goat's diet consists mainly of the leaves of bush species.
2. At a grazing intensity of 2,1 ha/Boer goat the bush cover below the grazing line was drastically reduced. As a result of this treatment grass production increased and the perennial species multiplied, but at the expense of the Boer goat.
3. With the carrying capacity of 12,85 ha per ox and 2,1 ha per goat, cattle produced more meat per ha than goats. Even where half the cattle were replaced with goats in the ratio of 1 bovine:6 goats, the group containing cattle only produced more meat per ha than the group containing cattle and goats.
4. It would appear that a cattle:goat ratio of less than 1:2 should be applied on this veld if the goats are to attain optimum production as well.

Similar trials on the introduction of the Boer goat into cattle enterprises in the false thornveld of the Eastern Province were started during the year under review. The aim is not only to control bush encroachment but also to achieve higher red meat production per ha.

BUSH ENCROACHMENT

Bush encroachment remains one of the biggest problems of the bushveld areas. The main species that occur in the various areas and cause problems have already been recorded in previous reports.

Research on the chemical and biological control of bush encroachment is continuing. The progress made, and the most important findings, are as follows:

Follow-up spraying carried out as part of the aerial spraying projects in SWA provided further confirmation for the promising results already obtained with regard to the selectivity of Tordon 225 used against aggressive bush species.

Where the bush growth was stratified into layers it was found that the bottom layer of young bushes was effectively screened from falling spray and so able to survive. Follow-up treatments required to control these plants are already being investigated.

In the dense bushveld of Tsumeb the increase in the grass yield available for grazing the second season after spraying with 1,5 l/ha of Tordon 225 was 170 per cent or more.

In the thornveld of Otjiwarongo, where *Acacia* species predominate, an increase of 109 per cent over the control was obtained with the same levels of spraying. It is anticipated that in years when the rainfall is poor the differences will be bigger.

It is reported from the OFS Region that a number of swarthaak bushes *Acacia mellifera* var. *detinens* died on hard-veld on farms where there is a dense grass cover.

An action committee was formed in the Coastal Subregion of Natal to combat bush encroachment.

In the Karoo Region the favourable conditions made it possible to control the encroachment of undesirable plants by burning.

VELD WEEDS

The favourable conditions of the past few seasons and the consequent dense vegetation have complicated the control of veld weeds. Floods this year and in previous years also meant that certain weeds spread faster. Since, in addition, farmers are not showing the same enthusiasm about controlling weeds, the campaign to control noxious weeds appears to be coming to a standstill.

JOINTED CACTUS

As in the past, this weed received the most attention, and far bigger sums were spent on its control than on controlling other weeds.

The latest position with regard to jointed cactus infestations can be summed up as follows:

	1976	1975
Number of owners/occupiers involved	1 701	1 681
Size of properties (ha)	1 644 026	1 637 669
Infested veld (ha)	825 064	824 342
Infested veld under control	650 806	666 238

It is apparent from this table that there has been a decline in the efficiency of the programme, despite a sustained inspection programme. This is ascribed to the following:

1. Dense vegetation makes control difficult. In lighter infestations especially it is extremely difficult to find all the young plants and loose joints.
2. Sustained control requires adequate labour and supervision. Farmers often do not even have enough labour for the routine work on the farm.
3. The control of jointed cactus has no economic advantage for the farmer, so farmers tend to put other farming practices before control measures.

In these circumstances and after almost 19 years of control it is difficult to motivate farmers sufficiently. The success achieved has been due largely to the legal obligations imposed on landowners - obligations which have been continually brought to their attention by the extension service.

Research on the biological control of jointed cactus is proceeding. The release of a new insect *Fopodia xapiacola* for biological control has been approved.

NASSELLA-TUSSOCK

This grass is regarded as one of the most potentially dangerous weeds that have ever entered the country. On a study tour to Australia and New Zealand information was obtained on the control of the weed and on the incidence of the plant in its

country of origin, Argentina. The grass has been finally identified as *Stipa trichotoma*.

Spraying trials were carried out with various weedkillers. Spraying with glyphosate (Roundup) was more effective when 8 litres per ha was applied than when the dosage was 4 litres per ha. Spraying was more effective during December than during February. With propop (Dalapon) the time when spraying is carried out does not appear to make any difference. The most promising results with weedkillers were obtained with bromacil (Hyvar X).

Research on control measures is proceeding. In the Barkly East extension ward an organised campaign was launched by farmers to eradicate the weed.

OTHER WEEDS

In the Natal Region weed control trials are at present being conducted in 17 localities in co-operation with the Department of Forestry. The chief weeds involved are bramble *Rubus* sp., bugtree *Solanum* sp., paraffin bush *Eupatorium odoratum*, pereskia climber *Pereskia* sp. and giant setaria *Setaria chevalieri*.

Control programmes and inspection campaigns against the other declared weeds are continuing and good progress is being made against *Lantana camara* and *Hakea* in the Eastern Cape Region. Since the previous year the number of properties infested with silverleaf bitter apple has increased from 151 to 170.

POISONOUS PLANTS

Gifblaar and gousiekte bush caused considerable problems in the sandy areas of the

Western and North-Western Transvaal, especially during early spring.

Senecio retrorsus remains a major problem in the Eastern Cape. Research shows that the plant cannot be controlled by veld management alone, but there are indications that it disappears when the veld is fertilised.

BOTANY

During the year under review a large number of publications by the Botanical Research Institute appeared or went to press - an outstanding achievement.

Two volumes of *Flora of Southern Africa* are in press. Volume 1 of *Genera of Southern African Flowering Plants* has appeared in print and two parts of Volume 12 of *Bothalia* are in press. Volume 43, Parts 3 and 4 of *Flowering Plants of Africa* has appeared and Volume 44, Part 1 and 2 is in press. Fifty-nine articles by members of staff were published. A new, richly illustrated edition of Acocks' *Veld Types of South Africa* was issued and a second *Memoir of the Botanical Survey of South Africa* is being printed. The Institute has probably never before published so much in a single year.

Special attention was devoted to weeds, and botanical studies of *Lantana camara*, jointed cactus *Opuntia aurantiaca*, Kariba weed *Salvinia molesta*, water hyacinth *Eichhornia crassipes* and other water weeds progressed very well. The campaign to make farmers aware of the dangers of the weed *Nassella-tussock Stipa trichotoma* was one of the most effective the Department has ever undertaken.

Despite the vast amount of work attached to the computer data bank for storing herbarium data a record number of plant identifications 315



Fruit and seed of the pumpkin family (Cucurbitaceae) that were recently collected in South West Africa for the germ plasm bank

were nevertheless made. In addition, over 28 000 specimens were added to the collections during the year.

In the Botanic Garden the planning of tree planting for all sections of the Garden received particular attention. When the tree planting programme has been completed the basic layout of the Garden will be complete and it will be possible to give more attention to expanding the various sections.

PLANT STUDIES

HERBARIUM AND INFORMATION SERVICES

Information

Nearly 31 500 plant specimens were identified during the year under review. The identifications were made for research officers of the Institute, other institutes, nature conservation departments, farmers, universities and members of the public. Information was also provided on many other aspects of plants in South Africa.

Development

In all 28 628 specimens were added to the herbaria of the Institute. Material was acquired by members of staff on collecting expeditions, through exchange with herbaria in many parts of the world and through donations.

Computerisation

Almost half the computer programme required for the retrieval of herbarium data have now been written by the Data Section of the Department. Most of the 415 000 herbarium specimens already encoded have been accessioned to the computer, checked for errors and corrected where necessary. When a further 40 000 specimens have been encoded, all the Southern Africa material in the National Herbarium will have been encoded.

Weeds

Officers of the section are studying the taxonomy of two noxious weeds *Lantana camara* and *Opuntia aurantiaca*. *Lantana camara* is now known to be a mixture of parental species and their hybrid progeny and, as such, presents a complicated reproductive situation which could account for conflicting reports on its response to different control methods.

The investigation of jointed cactus *Opuntia aurantiaca* has shown that it may be of hybrid origin. Research to determine the putative parental species and their distribution is now being undertaken. Further cytogenetic study is needed to confirm the hybrid origin of this plant.

Research

Taxonomic research by members of the section is being conducted on the Fabaceae,

Cyperaceae and Ericaceae. A revision of *Thunbergia* (Acanthaceae) has been completed: Of the eighteen species originally described from Southern Africa, only twelve have been upheld as valid species. The leaf, seed and pollen surfaces were studied by means of the scanning electron microscope to aid in the delimitation of the species.

A revision of the species of *Eriocephalus* (Asteraceae) occurring in South-West Africa was also completed.

FLORA RESEARCH

Flora of Southern Africa

A new format for this publication was finalised and distributed to contributors. The object is to speed up publication and decrease costs. Two volumes were sent to the printers, namely -

Volume 16,2 Caesalpiniaceae, and

Volume 22 Ochnaceae to Cactaceae.

Progress was made with the following plant groups:

1. *Ornithogalum*. Seven of the 54 species in South Africa were newly described. Information is given on aspects such as toxicity and cultivation.

2. *Loranthaceae* and *Viscaceae*. A study of classification and cytogenetics resulted in the discovery of two new genera and several new species. Permanent interchange of chromosomes, a phenomenon seldom reported previously, was found to occur frequently in *Viscum*.

3. *Ranunculaceae*. Work was begun on *Anemone* and *Knowltonia*.

4. *Caryophyllaceae*. A revision of the genus *Silene* is well advanced.

5. *Crassulaceae*. Most of the work on this large family has been completed. A 144-page monograph on *Crassula* has been submitted to the printers.

6. *Onagraceae* requires only finishing touches.

7. *Asclepiadaceae*. Attention was given to the Stapelieae and the genus *Brachystelma*.

8. *Lamiaceae*. Forty species belonging to 12 genera were written up.

Plant collectors

An account of botanical collectors in Southern Africa is being compiled as a supplement to Flora of Southern Africa. Biographical information is being summarised with special reference to collecting activities. Collectors from A to K have been written up.

Genera of Southern African Flowering Plants

Volume 1 (Dicotyledons) appeared in print in September 1975. Volume 2 (Monocotyledons) was sent to the printers and is due to appear very soon.

Cytogenetics of *Eragrostis curvula*

Representatives of the *Eragrostis curvula* complex appear to propagate asexually on the whole. Several plants that showed signs of sexuality were found, however. It appears that the sexual population which gave rise to the complex differs morphologically from the complex.

Grass anatomy

Anatomical data have been used to determine in which South African species the photosynthetic fixation of carbon follows either the so-called C3 or the C4 pathway. The distribution of grasses has been plotted and the occurrence of C3 and C4 species is being correlated with habitat features. The work has thrown new light on the adaptive and evolutionary significance of the two carbon fixation pathways in grasses.

Pretoria flora

A key to the 120 families in the area has been largely completed. 430 illustrations were added and descriptive keys to 110 species were compiled.

South African Plants

The first in this series of one-page pamphlets has gone to press. It is largely concerned with plants of economic importance and trees and shrubs in South and South-West Africa.

Liaison Officer, Kew

In addition to the usual liaison duties for the Botanical Research Institute, enquiries concerning identifications, taxonomic problems and literature on South African plants were received from Kirstenbosch and the Universities of Cape Town, Potchefstroom, Pretoria, Stellenbosch, the Witwatersrand and Zululand.

Many visitors from South Africa were also assisted to make full use of the many research facilities available at Kew.

ECONOMIC BOTANY

Cancer research

Screening of South African plants for activity against cancer is continuing. This year a total of 1 500 kg of material was forwarded to the United States Department of Agriculture. So far about 20 South African species show antitumour activity.

Paleo- and ethnobotany

A preliminary survey of the extant woody indigenous species in the Border cave area (Northern Zululand) has been completed. Well-preserved seed and leaves occur in the cave deposit down to levels of about 70 000 years B.P. These plant remains represent the oldest known material of its kind in Southern Africa. Approximately 25 per cent of the species from the

deposit are no longer found in the surrounding area.

Detailed analyses of the data with regard to their paleo- and ethnobotanical, phytogeographic and climatic significance have not yet been made. It is clear, however, that interesting results will be obtained in these spheres.

Conservation of germ plasm

Since this project was initiated last year, considerable progress has been made with the collection of germ plasm: To date 345 seed samples of indigenous crops and 230 samples of other indigenous plant species have been collected for storage in the germ plasm bank. These samples were obtained from high priority areas of Northern and Southern South-West Africa.

Nassella research

During a recent tour of South America, Australia and New Zealand, much information was gathered on the occurrence and control of *Nassella*-tussock *Stipa trichotoma*, a dangerous weed in high yielding grassland. It would appear that afforestation is the best long-term control measure for dense tussock infestation in high rainfall areas.

There are also interesting possibilities for the biological control of *Nassella*-tussock, which suffers from heavy insect and fungal attack in its native South America. An extensive programme was launched to make farmers aware of the dangers of *Nassella*-tussock, to enable them to identify the plant, and to advise them on how to protect their farms from infestation and what to do if infestations are discovered.

Other alien invaders

A survey of the distribution of the water weed Kariba weed *Salvinia molesta* in the Letaba river system was completed. As part of the water weed survey of the Transvaal 35 dams of the Department of Water Affairs were visited and intensively collected, which completed the first phase of the project. The collection of information on the characteristics and distribution of terrestrial weeds is continuing.

Survival studies

The second edition of a handbook on the basic principles of survival in the veld was completed and published. Remote areas in Southern Africa were visited and much information on the useful and edible plants of these areas was obtained. Detailed area studies are now being undertaken.

Poisonous plants

Data on 100 plants poisonous to humans have been put on computer data sheets for processing. Literature was scanned for information on a further 400 species for inclusion in the data bank. A field



Part of the Landsat-B satellite image of the Thabazimbi area which was taken recently. The surface area covered by the whole image was 1 277 300 ha. More than 90% of the black or dark grey surfaces show veld fires, but some of them are ploughed land on dark soil

investigation service for the investigation of serious cases of stock poisoning was provided.

Distribution of trees in the Transvaal

The project on the distribution and ecology of the indigenous trees and woody shrubs of the Transvaal is continuing. A distribution map for each of the 900 species has been drawn up and a much improved base map showing in detail the physiographic features of the project area is being prepared from a mosaic of satellite photographs. This will make it possible to obtain an immediate visual picture of distribution patterns.

ECOLOGICAL RESEARCH

SOUTH AFRICAN SAVANNA ECOSYSTEMS PROJECT

During 1975/76 the Institute was responsible for the co-ordination of 42 projects covering primary producers, consumers, decomposers, water and mineral cycles and mathematical modelling components of the ecosystems project. These projects were undertaken by five universities, the Department of Agricultural Technical Services and the Transvaal Provincial Administration in a multidisciplinary approach to the study of structure and function in a savanna ecosystem.

The Institute was also responsible for the design of a computer data bank for the project. The collection and processing of all data from individual projects were handled by the Institute in

collaboration with the Data Section of the Department of Agricultural Technical Services.

In the tree growth studies a more detailed picture of the nature of successive growth flushes of trees is emerging. Thus in *Ochna pulchra* only relatively few twigs extend greatly in the first flush whereas those twigs involved in a second flush extend uniformly. Another finding which will affect future tree growth sampling procedures was that individual twig growth rates are not independent of the size of the tree, although in *Burkea africana* this does not hold if the twigs are branched.

WESTERN TRANSVAAL SURVEY

Vegetation studies in Acock's Veld Types 18, 19, 13 and an outlier of 16 continued over the western part of the Transvaal System and the Bushveld Igneous Complex. Increased attention has recently been focussed on the vegetation of kloofs and river banks. A broad factual foundation has been laid on which to base recommendations for the Department of Planning and the Division of Agricultural Planning and Extension of the Transvaal Region.

LANGEBAAN AREA NEAR SALDANHA BAY

A paper describing the plant communities, including wetland communities, of the Langebaan area is at the manuscript stage. The most widespread veld type in the area, West Coast strandveld, has been subdivided into a number of communities which occur on geological features

such as Recent sands, Tertiary limestone and granites.

MARSH ROSE *OROTHAMNUS* *ZEYHERI*

Periodicity records and growth measurements of *Orothamnus* individuals are continuing. The known total number of individuals within the Kogelberg State Forest has fluctuated between 25 plants in 1969 and a known maximum of 1 767 plants in 1974. A decline in numbers has subsequently taken place owing to natural mortality and fungal infection.

ZULULAND COASTAL DUNES

Because strip mining of the coastal dunes is about to commence, preparation of vegetation maps to establish conservation priorities was an urgent necessity. Vegetation maps to a scale of 1:12 000 were prepared by interpreting aerial photographs and checking at ground level. A comparison between aerial photographs dating from 1937 and more recent photographs revealed far-reaching changes.

A report on the conservation priorities of the area is being prepared.

AQUATIC ECOLOGY

Steady progress is being made with the Braun-Blanquet type survey of aquatic vegetation. Ecophysiological studies of water hyacinth *Eichhornia crassipes* and Kariba weed *Salvinia molesta* have been undertaken to determine growth rates and yield coefficients under various conditions of temperature and nutrient status. On the basis of these studies growth kinetics models can be derived for various combinations of conditions, in order to predict the minimum standing crop to utilise available nutrients, the time taken to produce this yield, and the harvesting frequency required to control the problem.

SURVEYING THE OCCURRENCE AND EXTENT OF VELD FIRES IN SOUTH AFRICA USING SATELLITE IMAGERY

In a joint project using space satellite imagery from Landsat-2, supplied by the National Aeronautics and Space Administration of the United States, the time of occurrence and extent of veld fires are being mapped for various parts of the country. Altogether, approximately 76 images have been analysed, mainly for the summer rainfall regions of the Transvaal, Orange Free State and Eastern Cape Province. Each satellite image covers approximately 3 million hectares.

Approximately two thirds of the images for the period 11.7.1975 to 29.1.1976 show clear evidence of veld burning, most burning occurring as expected during the dry season up to the middle of November.

Preliminary analyses of the satellite imagery received indicate that the highest percentages of

burned veld are in the Pretoria, Western Transvaal and Eastern Transvaal areas, where they are usually between 2 to 4 per cent of the total area, with up to 8 per cent locally in the Eastern Transvaal. Regarding particular veld types photographed by Landsat-2 on 6.9.1975, 5,8% (120 600 ha out of 2 088 800 ha) of Western Transvaal turf thornveld vegetation has been burned, 3,0% (3 000 ha out of 98 900 ha) of Pietersburg plateau grassveld, 3,0% (82 000 ha out of 2 716 600 ha) of sourish mixed bushveld, 2,5% (60 500 ha out of 2 422 700 ha) of bankenveld grassland, 1,6% (59 400 ha out of 3 777 000 ha) of mixed bushveld, and 1,2% (60 500 ha out of 519 100 ha) of Transvaal *Cymbopogon themeda* grassveld. The work is still proceeding for other veld types and other parts of the country.

JOINT SOUTH AFRICA-BOTSWANA *SALVINIA MOLESTA* SURVEY AND PILOT CONTROL PROJECTS IN THE LINYANTI-KWANDO RIVER SYSTEM

Monitoring of the continuing spread of Kariba weed *Salvinia molesta* in the Linyanti-Kwando River System on the border between Eastern Caprivi and Botswana has continued over the past year, together with the assessment of the results of the pilot spraying project initiated during April and June 1975. Attention has been concentrated on these sections of the Chobe-Linyanti-Kwando River System in an endeavour to prevent this weed from spreading further westwards.

It is now evident that the new occurrence of *Salvinia* in the Kwando River found during 1974 entered the Botswana-Caprivi section of the Kwando River from upstream in Angola. Although the control measures adopted by both Botswana and South Africa since the 1974 discovery of this new infestation have markedly suppressed growth of the weed, it has not been possible to eradicate it from this section of the river. This is due to both the extremely difficult swampy terrain and the energetic regrowth of the weed from any small pieces that escape. As a result the weed is now closer to the Okavango Swamps - a disturbing prospect.

In the pilot spraying project initiated on the Linyanti section of the River and in Lake Liambezi the results of the aerial spraying with paraquat were very promising. The blocked section of the Linyanti River was cleared and the floating mats of *Salvinia* which had been up to 0,5 metres thick and had covered 100 per cent of a section of Lake Liambezi were reduced eight months later to less than 10 per cent.

To cope with the expected regrowth of *Salvinia* and to provide a possible means of long-term control, an acridid grasshopper (*Paulinia*) and a weevil (*Cyrtobagus*) that are specific feeders on *Salvinia molesta* have been released by Botswana biologists and experiments are being continued with herbicidal spraying.

Owing to the protective cover afforded by the plants, the herbicidal spraying of *Salvinia* where it occurs in the *Phragmites* and *Cyperus papyrus* reedswamp was the least successful. It is hoped to establish whether the biological control agents will benefit from overwintering in the protective reedswamp and whether they will be able to control the weed in this particular habitat.

PRETORIA NATIONAL BOTANIC GARDEN

With the development of the Garden there has been a considerable increase in maintenance work. The activities of the past year have therefore been aimed at simplifying maintenance.

Special attention was given to stormwater drainage, the removal of temporary auxiliary plantings in the arboretum areas of the garden and the planting of ground covers, for which 36 000 plants were grown and transplanted.

NEW DEVELOPMENTS

A paved road 4 metres wide was built between the main building and the nursery, and an additional carport was erected.

Ninety-seven trees of 33 species were planted in the inland forest section of the Garden.

The site for plants from South-West Africa was prepared. The site for lowveld vegetation has been planned in detail and preparations made for further development.

NURSERY

Important improvements were made in connection with the housing of live plant collections. A large greenhouse was erected for the succulent collections; it is covered with fibreglass and plants are arranged according to growth requirements, genus and species.

A separate security unit was equipped for use by the economic botany section.



Vegetation on the hot northern slope of a norite koppie near Rustenburg. This area is included in the survey of the Transvaal Bushveld undertaken by the Botanical Research Institute. *Euphorbia cooperi* and *Croton gratissimus* are characteristic of this area

PLANT RECORDS

During the past year 1 121 new plant collections were placed on record and the old records brought up to date. Plants in the inland forest area and most of the coastal forest area, and those in the *Protea* collection were given permanent nameplates and the information was recorded in the block records.

PUBLICATIONS

BOTHALIA

Proofs of Volume 12, 1 were corrected and this number is expected to appear in print very soon. The manuscript of Volume 12, 2 went to press in April 1976.

FLOWERING PLANTS OF AFRICA

Volume 44, 1 and 2 went to press in October 1975 and Volume 43, 3 and 4 appeared in print in March 1976. The journal continues to attract contributions from the universities and overseas.

MEMOIRS OF THE BOTANICAL SURVEY OF SOUTH AFRICA

The second edition of Acock's Veld Types of South Africa, with plant names updated and 104 photographs included, appeared in July 1975. This memoir is selling very well both in the Republic and overseas.

4. Field Husbandry

MAIZE

BREEDING AND SELECTION

The Natal Maize Breeding Section released 28 white and 40 yellow inbred lines to South African maize breeders in 1975. This release is expected to make a significant contribution towards improving the standard and quality of future hybrids in the country. This release follows a previous one in which 63 open-pollinated maize varieties, synthetics and composite gene pools were made available to breeders and the germ plasm bank.

Of particular interest and promise among inbred releases is a group that contains a new gene (HtN) for resistance to *Helminthosporium turcicum* leaf blight. American inbred lines converted to this gene have shown exceptional promise in experimental hybrids grown in various parts of South Africa. This development is of significance in view of the increasing build-up of this disease in the major production areas in South Africa.

Indications are that hybrids containing these inbred lines are competitive with the best commercial ones, as was observed in experiments conducted at Pietermaritzburg, Cedara, Delmas and Tabamhlope. At Tabamhlope, some of these hybrids approached a yield of 100 units of 100 kg per ha at high populations in a season that may be regarded as slightly below optimum for yield.

As a sequel to the previously reported progress made in the breeding of nutritionally improved opaque-2 (high lysine) maize, the important phase has been reached where the feasibility of its general release in South Africa is being critically assessed on a commercial scale. The yields of experimental high lysine are at the same levels as current commercial hybrids.

The use of better-adapted and higher-potential hybrids, together with improved agronomic techniques, is making the achievement of yields of the order of over 6 000 kg per ha by farmers commonplace, while research yields of over 10 000 kg per ha are no longer considered exceptional in Natal.

At the Dundee Research Station, yields of over 14 000 kg per ha were obtained in a yield trial during the 1975/76 season. Research and extension staff believe that Natal's maize crop could double within the next few years as farmers begin to realise the potential for high production.

The Department and private organisations planted 35 cultivar trials throughout the country in order to evaluate maize cultivars. The trials

consisted of 90 entries, 20 of which were new cultivars not yet included in the varietal list and 70 standard cultivars.

At some places extremely high yields of up to 9 000 kg per ha were obtained, and some of both the new and the standard cultivars are promising. It was found that as a result of the favourable moisture conditions the cultivars with a long growing season, in particular, did extremely well. These cultivars have a higher yield potential than cultivars with a shorter growing season.

The occurrence of the most common diseases was extremely low, with the exception of *Helminthosporium turcicum*, which was severe. This was possibly caused by the extremely wet conditions.

Morphological and physiological characteristics

- Good results have already been obtained with selection for stalk strength using pressure apparatus. A simultaneous reading of the degree of disease helps make selection for better stalks more effective.

As regards selection for drought resistance, it appears that the method of testing the reaction of seedlings at high temperatures in the glasshouse should give good results.

Population development - During the past season new pure strains were developed and single hybrids and crossings were composed to determine general and specific combination ability.

The development of new pure strains is now entering the third generation of inbreeding and new lines will be available within the next two seasons.

The combination ability of a series of North American and local material was determined with the aid of two tester parents in order to establish the extent of both general and specific combination ability. Material with promising heterotic effects will be used for pure strain development.

Sweetcorn - An extensive sweetcorn breeding programme was continued in collaboration with the canning industry. Next season a series of eight promising yellow sweetcorn hybrids will be cultivated on a larger scale for commercial planting.

DISEASES AND PESTS

A glasshouse study has shown clearly that leafhoppers carry a complex of virus diseases. Thus far streak and maize dwarf virus have been isolated.

Preliminary glasshouse trials have shown that anthracnose causes seedling wilting and retards the

growth of seedlings. Nitrogen fertilisation results in a higher percentage of seedling wilting.

Research has shown that rates of nitrogen application result in marked increases in the incidence of leaf streak and ear rot. The incidence of both diseases is higher at low levels of phosphorous nutrition, while high levels of soil acidity increase the incidence of diseased ears.

Cradock - The research programme at the Cradock Experimental Farm, which serves the Fish River irrigation area, is at present directed at the evaluation of maize cultivars which are adapted to this area. This programme links up with the National Evaluation Programme of the Summer Grain Centre.

Yields of 98,9 to 129,9 bags (90 kg) per hectare were obtained this season from the 10 best cultivars (over the past three seasons). A plant population of 40 000 plants per hectare gave the highest yield. The best planting time is from the middle of October to the end of November. Later plantings are risky and give lower yields.

MAIZE SILAGE

Three maize hybrids, SR 52, PNR 22 and PNR 82, of maturity rating late, medium and early, respectively, were grown at three population densities, viz 33 333, 44 444 and 66 666 plants per ha and harvested at three growth stages, viz 4, 6 and 8 weeks after silking.

The highest yields exceeded 20 000 kg per ha and were achieved with SR 52, followed by PNR 22.

Increases in population density resulted in small but significant increases in yield, but had no effect on quality. Both yield and quality were improved by delaying harvesting during the period 4 to 8 weeks after silking.

SOIL SAMPLES

The increase in the number of soil samples handled continued, with 4 053 samples received from farmers in the Natal Region during this year. This represents an increase of 39 per cent over last year. Based on 1975 results the estimated cost of this service is R7,60 per sample, approximately only 15 per cent of which is recovered directly from farmers.

WHEAT

CULTIVAR TRIALS

The wheat cultivar trial with 22 entries of released cultivars was started at 24 places in 1975/76. The various types in terms of straw length were fertilised differently and various seeding densities were applied.

Taking the average yield for the trial as norm, the highest yield was obtained in the *Swartland* at Malmesbury, Riebeeck West and Langgewens. At Malmesbury the average yield from the B trial was 3 002 kg/ha, while that from the A trial was 2 169

kg/ha. The semi-dwarf types gave much higher yields than the longstraw cultivars.

The Free State cultivar *Bernita* does not appear at all suited to the *Swartland*. As in 1974, the best cultivar average at all places in the *Swartland* was obtained from SST3, which had an average yield of 2 153 kg per ha. *Elize* and *Inia* also gave average yields of more than two metric tons. *Sonderend*, which was the best cultivar after those mentioned above, gave an average yield of 1 965 kg per ha over the whole *Swartland*.

T4, which usually does very well, had a poorer season, possibly because of the drier spell in September.

Tosca and *Kasteel* were the best long growing season cultivars, with average yields of 1 835 and 1 824 kg per ha, respectively.

In the absence of a stem rust epidemic T4 fared best. Farmers are warned, however, that T4 would do very poorly in a stem rust year. SST3 (1 626 kg per ha) came close to this performance, as did SST6. *Elize* was one of the best of the remaining cultivars. *Janitor*, *Memnon* and *Tosca* were the best of the longstraw cultivars.

In the Eastern Cape it was again SST3 that did well, while *Janitor* and *Lee Mida* fared best of the long growing season types.

WHEAT STRIP DEMONSTRATIONS

Strip demonstrations are sown on producers' farms to enable them to compare the newer types of wheat with the existing types within 40 to 50 km of their farms. During the past season this type of demonstration was undertaken at 46 places, with an average of 20 entries per demonstration.

WHEAT STRAINS

Elite trials were again planted in various ecological subareas in order to make stable, high-producing, newly bred wheat strains of a good quality available to the industry.

During 1975 these trials were planted at four places each in the *Swartland* and *Rûens*, as well as at three places in the South-Western Districts and one in the Eastern Cape.

The release of the two strains 70/569 and R074/4 was requested on the strength of data collected over the period 1973-1975.

Strain 70/569 is a selection developed by the Department's *Plant Breeding Section* in the Winter Rainfall Region, and has been released under the name *Liesbeeck*. This strain was released chiefly because it has shown high resistance over the years.

Strain R074/4, which is a breeding strain of the *Roodeplaat* Research Station, was released under the name *Elrina* because of its good yields in the Winter Rainfall Region and under irrigation. From data collected over the two years *Elrina's* performance can best be demonstrated by comparing its biperennial yield with that of SST3.

Elrina compares favourably with the other cultivars as regards susceptibility to stem rust. Seed from the new cultivars will be released to the industry at the end of 1976.



The artificial inoculation of mature wheat plants with a suspension of stem rust to examine the resistance against rust of different strains

Yield in kg per ha

Cultivar	Vredenburg	Pools	Moorreesburg	Philadelphia
Elrina	2 219	2 478	2 142	2 828
SST3	2 588	2 404	2 592	2 824
	Jongensklip	Bredasdorp	Heidelberg	Albertinia
Elrina	2 057	868	2 015	1 740
SST3	1 804	798	1 786	1 257

Of the longstraw types, strains 72/101 and BT38 are being multiplied for possible release, while RRR362-72 and 71/512 have been selected from the semi-dwarf types.

Released cultivars and promising strains were evaluated at Bethlehem, Bultfontein, Kroonstad, Villiers, Verkykerskop, Marquard and Clocolan in the Highveld Region. Three planting times were investigated at all these places. It was striking that each area with a particular planting time favoured specific cultivars or strains.

In the Eastern Free State three planting times can easily be fitted in, while only winter types give satisfactory results in the Western Free State. Lower rainfall and moisture storage potential are largely responsible for the unsatisfactory yields.

These results confirmed clearly that different cultivars have specific planting times and that fertilisation, and more specifically nitrogen fertilisation, and seeding density should be adjusted accordingly.

From the International Winter Wheat Rust Nursery (IWWRN) 21 entries were identified with a yield potential equal to or better than the cultivar Betta and with a resistant reaction to stem rust. Some promising entries for winter wheat preliminary variety trials (1976) were obtained from the International Winter Wheat Performance Nursery (IWWPN) - 9 entries) and from the High Lysine Nursery, Nebraska, USA (19 entries).

Work proceeded at the Bethlehem Research Station on the back-crossing programme to incorporate *Triticum timopheevi* stem rust resistance into the cultivars Flameks, Betta and Gaines. From this programme 349 lines will be evaluated in winter wheat preliminary variety trials during 1976 and 150 lines in intermediate wheat trials.

In addition, both *Agropyron elongatum* and *Triticum durum* resistance has been incorporated into adapted cultivars. Among the spring wheats, the back-crossing procedure has also been used to incorporate stem rust resistance into Inia 66 and T4, using the three sources of resistance listed above plus several others including the wheatrye translocation (WRT 238.5 - Sr 27) stem rust gene.

Crosses between winter and spring wheats were made to improve the dryland adaptability, Septoria resistance, yield potential and maturity range among the spring wheats while improving the disease resistance and dwarfing characters of the winter wheats. Selections from Bezostaya/India 66 cross (106 lines) showed considerable promise.

INTERNATIONAL TRIALS

11th Iswyn: This yield trial was conducted at Roodeplaat for trial calculations only, but a small planting was also made at Makatini to determine rust readings. A good *differentiation* was obtained for both stem and leaf rust and several entries were selected for their relative resistance to these diseases.

Sarwein: This is a trial with representative Southern African cultivars and is aimed at encouraging the exchange of material between countries to mutual benefit.

Sets of seed were also received from Rhodesia, which started the trial, and were sent to several African countries from here. Trial results were received from Swaziland only. The results from Loskop and Vaalharts showed very good yields, although not from the new material from elsewhere. Elize gave 6 700 kg per ha, which is an exceptionally high average.

PLANTING TIME

Yield results show that the best planting time for Inia (a short growing season cultivar) at



A mini-combine harvester reaping wheat crops on experimental plots in the Winter Rainfall Region

Langgewens and Tygerhoek is roughly the end of May. At Outeniqua, where the growing season is longer, the optimum planting time is between 15 and 30 June.

SEEDING DENSITY

An increase in blade numbers per unit of area was obtained when the seeding density of semi-dwarf cultivars was increased from 60 to 100 kg per ha. The highest yield was obtained with a seeding density of 80 kg per ha, however. The higher seeding density reduced yield components such as kernel mass and number of kernels per ear.

FERTILISING

Only the treatment in which 3 184 kg of straw per ha was applied and the fertiliser was balanced and applied at fallowing time, did significantly better than the ordinary wheat fallow (with full fertilising).

PESTS

Trials at the Vaalharts Research Station showed that the most economic number of sprayings necessary to protect wheat effectively against aphids depends on the aphid numbers in a particular season. In 1974, with a mild aphid infestation (average 73 aphids per blade) one spraying for the whole season was the most economic. In 1975, with a heavy infestation (149 aphids per blade), four sprayings were the economic optimum.

It appears that the flowering stage is the critical time for ridding wheat of aphids.

WEED CONTROL

Two herbicides, viz Probe (Methazole) and HOE 23408, were evaluated at the Welgevallen Experimental Farm, Stellenbosch. Probe was applied as a pre-emergent application twenty-four hours after sowing. HOE was applied at the 4½ leaf stage.

HOE gave complete control of all grass weeds. Probe gave unsatisfactory control at both dosage rates.

On the farm De Grendel, Malmesbury, HOE 23408 gave significant yield increases at all rates tested, the highest being a 52,1% increase at 0,75 kg a.i./ha. These spectacular increases were achieved because this herbicide controlled both *Avena* (wild oat) and *Phalaris*, whereas the other herbicides tested in this trial controlled only *Avena*.

Phototoxicity trial of Difenzoquat (Avenge) on wheat cultivars - Previous work in 1974 and 1975 indicated that certain cultivars were badly damaged by Difenzoquat (Avenge), while others remained unaffected. To establish the degree to which the most popular wheat cultivars were detrimentally affected by this herbicide ten cultivars were sown at Langgewens Experimental Farm and plots were sprayed with Difenzoquat at 1,5 kg a.i./ha.

From this trial it was evident that the cultivars Flameks, SST3 and Zambezi were relatively unaffected by this herbicide, while Inia, Kasteel, Memnon and Sonderend showed an average yield depression of 10 per cent. Lee Mida and Raven showed yield losses of 40 and 50 per cent. It has thus been conclusively shown that this herbicide cannot be used on the cultivars Lee Mida and Raven.

OATS

As was the case last year, a record oats crop was harvested in 1975 and the Wheat Board purchased 77 000 tons.

Yields were generally better in the Rûens area than in the Swartland area as a result of good rains. Stem rust only occurred at a few places. The new cultivars released during 1975 again did well throughout the area.

Larger plantings of oats were made in the Karoo Region, mainly for use as winter grazing. The newly released cultivars Overberg and Perdeberg gave very good results both in trials and in practice.

EVALUATION OF NEW STRAINS AND CULTIVARS

With a view to releasing new oats cultivars on a continuous basis, Elite trials were planted at nine places in 1975, six standard cultivars being compared with 22 strains.

The strain 072/0, bred by the Plant Breeding Section of the Winter Rainfall Region, again did well and has been made available to the industry under the name Potberg. This strain is particularly resistant to rust.

Seed of the cultivar will be made available to the industry in 1976/77. The cultivar will be especially popular in areas where stem rust is a problem. As far as yield is concerned, the 1975 yield from Potberg at Rietpoel was 3 636 kg/ha, as against 3 336 kg/ha from Heros and 3 596 kg/ha from Overberg. At Albertinia Potberg's yield was 2 564 kg per ha as against 1 866 kg/ha from Heros and 2 778 kg/ha from Overberg.

In addition to the strain released as Potberg in 1976, another promising strain, 074/5, is being multiplied for possible release in 1977 or later, as required.

SEED MULTIPLICATION

To supply the industry with certified seed, 27 550 kg of Perdeberg seed and 15 000 kg of Overberg seed were provided. The following amounts of basic seed were supplied to the Wheat Board:

Langgewens	: 20x50 kg
Heros	: 10x50 kg
Overberg	: 20x50 kg
Perdeberg	: 20x50 kg

In a cultivar trial at Bethlehem consisting of 16 entries, good yields were generally obtained. The well-known cultivar Letoria gave a good yield and hectolitre mass, but the oats strain Heros, which was released in the Western Cape fairly recently, did exceptionally well. This cultivar has a shorter growing period than Letoria and its cold requirements is minimal. Heros can therefore be sown with great success in the Eastern Free State towards the end of winter.

An international oats rust nursery was established at Bethlehem and 28 types from a total of 108 were selected for further testing. The selected strains all showed good resistance to both stem rust and crown rust. At the same time other characteristics such as stem length, growing period, seed quality and yield were satisfactory.

The value of various oats cultivars as forage crops was tested in an experiment with eight cultivars and four methods of utilisation on the Outeniqua Experimental Farm. Balanced fertilising was applied.

As far as the green matter yield at George is concerned, the total yield for the season of stand repeatedly grazed at a height of 200 to 300 mm was best at four cuttings with 28,80 t/ha, as against 6,89 t/ha for the treatment where the stand was grazed once only at the same height, after which it was left to produce a seed crop. When oats was grazed twice only before being left to produce a seed crop, the difference from the plots continuously grazed was 12 t/ha.

The increase in the green matter yield between one and two cuttings in Mossel Bay was as much as 14,88 t/ha, with the total yield for the season at two cuttings being 22,30 t/ha.

As regards the "grazability" of cultivars at Outeniqua and Mossel Bay, the new Heros, Overberg and Potberg again showed that they can produce good green matter yields. At Outeniqua and Mossel Bay Heros did best with 20,39 and 18,75 t/ha, respectively.

The poorest seed yield was obtained at Outeniqua from oats which was sown early and never used as grazing.

Oats sown on the same day, but cropped off once and twice at heights of between 200 and 300 mm gave seed yields of 0,9222 and 0,997 t/ha, respectively, after being left for a final seed crop. From this it would seem that it can be advantageous to use oats for grazing as well as for seed production in the same year.

BARLEY

Generally barley production was not good in 1975 because the weather during harvesting caused the quality to drop below that of the previous season.

Total production this season was 58 000 tons. Only 32 000 tons of the barley was brewers' barley, the rest being Class C.

Because of the good yields obtained with the new cultivars, interest in barley production has increased over the past year.

In the Fish River irrigation area there is greater interest in the planting of barley for grain. A number of farmers had very good results and yields in the production of brewers' barley. However, the wet harvesting season adversely affected quality in respect of colour. The best cultivars for this area are Comma and Clipper.

Thirty-three strains were tested during the past season. Of the standard ones the new cultivar

Clipper did best with a yield of 3 072 kg/ha at Rietpoel.

Two strains from the trial, B72/2 and B73/1, both of acceptable brewing quality, will be multiplied for further evaluation and possible release.

Diseases such as *Helminthosporium* and *Rhynchosporium* played a greater role in 1975 than in 1974. The new cultivar Clipper seems to be susceptible to *Rhynchosporium* while Swannek is susceptible to *Helminthosporium*.

During the past season 30x50 kg of Clipper basic seed was supplied to the industry.

SOWING AND HARVESTING

Four cultivars have been tested in respect of two sowing dates and various harvesting methods. High yields of a better quality were obtained with a sowing time in mid May and the ripe barley being cut when yellow.

Cultivars differ in their reaction to sowing times and harvesting methods.



A researcher determining the mass of sheafs in wheat cultivar experiments

BUCKWHEAT

Buckwheat is regarded as a catch crop which can be planted considerably later than other summer crops because of its short growing period. Research at the Nootgedacht Research Station at Ermelo, indicates that the South African standard buckwheat cultivar takes twice as long as many imported cultivars to reach peak production, with the result that this cultivar cannot really be regarded as a catch crop.

Two months after planting at Ermelo the South African standard buckwheat only gave 15 per cent of the seed yield of a promising imported

cultivar. Even 105 days after planting it only gave 70 per cent of the peak yield already given by that imported cultivar 70 days after planting. There were also great differences in grain quality. The South African standard buckwheat is of acceptable quality, whereas the cultivar giving the highest grain yield throughout had the poorest quality.

Research during the past two years has identified certain promising cultivars and it is intended to test them at various places in the chief production areas.

GRAIN SORGHUM

The national grain sorghum cultivar trials of the past season comprised 42 entries, of which 5 were new entries, 35 well-known hybrids and 2 old open-pollinated varieties. Seed was sent out for 18 trials throughout the Republic, 1 in South-West Africa, 3 in the Transkei and 2 in Lesotho. From these trials grain yields of up to 9 000 kg/ha were obtained under irrigation and 5 000 kg/ha on dry land.

The incidence of redleaf, caused by a variety of fungi, caused serious damage to grain sorghum seedlings, especially in the North-Western Free State. It would seem that some cultivars are more susceptible to these fungi than others, while a few cultivars are hardly damaged by them at all. This disease will be studied more thoroughly in the future.

As a result of the very high rainfall during the past season weeds were more prolific and caused more problems than usual. Mechanical weed control is greatly hampered by wet conditions and chemicals are being used to an ever increasing extent. However, in areas with light soils the existing weedicides are not safe enough to use for grain sorghum and farmers in those areas have to rely on mechanical control.

POTATOES

Around 30 exotic cultivars were evaluated at two localities over a three-year period. The average yields per hectare for both localities during that period, from the cultivars that performed best, were as follows: Astrid - 2 722 x 15 kg, Baraka - 2 364 x 15 kg, Desiree - 2 249 x 15 kg, BP - 2 238 x 15 kg, Up-to-Date - 2 081 x 15 kg and Baku - 2 001 x 15 kg. In addition to producing high yields, these cultivars generally have a higher resistance to diseases (virus diseases and late blight) than Up-to-Date or BP.

Seed potatoes of Koos Smit and R100, the two recently released cultivars bred by the Department, are now available for producers of table potatoes. Another Departmental release, Sackfiller, is showing better resistance to leaf roll and virus Yⁿ than BP1 and appears particularly promising for autumn planting in Natal.

The cultivar and breeding strain evaluation programme, which is part of the Departmental national breeding programme, is now in full swing at 10 localities in various parts of the country.



Plantings of the Stevens lupin for the increase of seed to be exported to West Germany

Several of the 74 breeding strains tested in the Winter Rainfall Region at Outeniqua, Welgevallen and Karookop produced considerably higher yields than the standard cultivar BPI.

Late blight - The forecasting services undertaken by the Department in Natal and on the Highveld are highly valued by potato farmers. A large percentage of farmers follow the service faithfully. Apart from the fact that the farmers derive considerable financial benefits from avoiding unnecessary spraying, the disease is far more efficiently controlled when timeous and correct control measures are applied.

Jelly-end rot and Fusarium wilt - Trials during previous years indicated that fumigation with EDB against nematodes not only controlled the nematodes, but was possibly also efficacious against certain soil-borne diseases. Upon further investigation it was found that fumigation controlled such diseases very effectively. In some cases yields were increased considerably.

It was also found that a grass cover between the rows suppressed jelly-end rot and *Fusarium* wilt effectively, had a favourable effect on the yield and helped to control nematodes.

Virus diseases - During the 1975/76 season virus infection of seed potato plantings in the Winter Rainfall Region was very slight. This may be ascribed principally to:

- (a) Regular chemical control measures, together with a Departmental warning service to producers on fluctuations in population numbers of virus vectors during the growing season.
- (b) The acceptance in the Koue Bokkeveld of the recommendation that all aerial parts of potato plantings should be killed by spraying by 31 January.
- (c) Relatively low numbers of virus vectors during most of the growing season.

During the year under review 412 samples from the entry and production phases of the Sabie

stock seed potato scheme and the Potato Board's foundation seed multiplication programme at Lydenburg were indexed for sap-transmissible viruses. All the indexed samples proved negative, which indicates that the Sabie/Lydenburg foundation seed potato scheme has maintained its virus-free status.

Researchers are still attempting to obtain virus-free material of the cultivar *Earliest of All* for establishment in the entry phase of the Sabie scheme.

Identification of virus diseases - Virus purification was successfully carried out with the available equipment. The rabbit hutch at Roodeplaat has been completed and as soon as the small glasshouse for the establishment of pure virus sources has been erected, antiserum preparation for the serological identification of potato viruses will be started.

Heat therapy - The most essential equipment for the development of virus-free potato planting material by means of heat therapy and tissue cultures is already available at Roodeplaat and is at present being used for virus purification of the cultivars Elsa and 890/20.

TOBACCO

FLUE-CURED TOBACCO

The increasing incidence of black shank is a serious threat to the cultivars grown at present. Two races of the pathogenic fungus *Phytophthora nicotianae* B. de Haan var. *nicotianae* were identified in South Africa. The cultivars A22 and A23 which were released in 1970 are completely resistant to race 2, but are susceptible to race 1. Sources of resistance to race 1 have been found and appear to be polygenic. Resistance to race 2, on the other hand, is determined by a single dominant gene.

With the available knowledge, material and phytotron facilities the stage was reached within the space of three seasons where two resistant cultivars, viz TL33 and TL38, could be released to the industry. These cultivars yield better than Hicks and produce high quality tobacco. In addition these cultivars are resistant to the tobacco mosaic virus (TMV) and powdery mildew *Erysiphe cichoracearum* D.C., and have a high resistance to black shank races 1 and 2.

Progress has been made with breeding for resistance to potato virus Y (PVY), black root rot *Thielaviopsis basicola* (Berk. and Br.) Ferraris and rootknot nematode *Meloidogyne javanica* (Traub.) Chitwood.

BURLEY TOBACCO

Work continued on crossings and selections; the aim is high production and quality together with resistance to tobacco mosaic virus, powdery mildew and races 1 and 2 of the black shank fungus. Considerable progress has been made and there is a prospect of seed being issued on an experimental scale.

Progress was also made with breeding for resistance to potato virus Y, a virus disease which has caused a great deal of damage in several cultivation areas during the past two seasons.

AIR-CURED TOBACCO

Light and dark air-cured tobacco is subject to the same diseases as flue-cured tobacco. It has been found that Maryland 609 has a degree of resistance to race 1 of the black shank fungus. This property has been successfully transmitted to several promising breeding strains. Seed of one strain, CL8, has already been released to producers on an experimental scale. CL8 is also resistant to tobacco mosaic, powdery mildew and race 2 of the black shank fungus.

Work on crossings and selections is continuing, with the object of producing disease-resistant dark air-cured cultivars with a wide adaptability.

TURKISH TOBACCO

Strains that are resistant to tobacco mosaic and powdery mildew were selected and are being tested at present. The development of strains with resistance to black shank has already been started. Attention is also being given to "mammoth" types and very promising results have been obtained in this respect. A cultivar of this type may possibly be released in the near future.

ANTHER-DERIVED HAPLOIDS

The derivation of tobacco plants from anthers has the advantage that it is possible to obtain homozygotic strains within a relatively short period. With some crossings, particularly those where the object is to transfer resistance to disease, this method could save time. Haploid strains have been obtained and dihaploids (diploids) grown by

means of midrib sections taken from adult leaves of the haploid plants. Research on the possibilities of investigating the haploid technique is in progress.

PLANTING METHODS

Flue-cured tobacco

Rows 1000 mm wide, with a plant espacement of 500 mm and topping depths yielding 400 000 leaves per ha, produced the best results of the conventional espacements and topping methods for flue-cured tobacco.

Where row widths and plant espacements yielding up to 800 000 plants instead of 20 000 plants per ha were used, with topping depths that raise the leaf numbers to as much as 800 000, different results were obtained. It was found that with this "low profile" tobacco, as it is known, the dense espacement (500 x 250 mm and 80 000 plants per ha) produced the fastest leaf growth and the largest and heaviest leaves, but their stems were shorter, thinner and lighter. The growing period was far shorter than that of ordinary tobacco.

The highest yield and income were obtained with 560 000 to 800 000 leaves per ha. However, the highest yield accompanied by acceptable levels of nicotine and sugar was obtained from plants spaced 500 x 250 mm apart and bearing 7 or 8 leaves per plant. In this dense stand weeds and suckers were effectively controlled by chemical means - a fatty alcohol compound (1-octanol plus 1-decanol) and pebulate, respectively. Where chemical sucker control was applied to densely spaced and deeply topped tobacco the increase in the yield and income was highly significant. What is more, it is possible to harvest such tobacco in one picking. Modifications in the procedure, such as the replacement of the 500 x 250 mm espacement with double 250 mm rows every 750 mm and a 250 mm plant espacement, produced approximately the same results.

Light air-cured tobacco

Raising the leaf numbers from 240 000 to 400 000 per ha was accompanied by a considerable increase in the yield, but a plant espacement of 620 mm, where leaf numbers per ha were kept constant by manipulating the topping depth, produced significantly poorer results than 500 mm.

Dark air-cured tobacco

In the case of dark-cured tobacco wider espacement, deeper topping and consequently fewer leaves per ha are indicated, in order to ensure the desired dark product. Raising the leaf numbers from 120 000 to 300 000 per ha was accompanied by major increases in production. According to these results no change in production is to be expected if the plant espacement is changed from 500 to 1000 mm, provided the leaf numbers per ha are kept comparable by means of topping. With all the plant espacements the highest and comparable yields were obtained with 300 000 leaves per ha.

Burley tobacco

Particularly high demands are made on the quality of Burley tobacco, and this class of tobacco is known to be very sensitive to the effects of cultural practices. Plants spaced at 250 mm were compared with those spaced at 500 mm in rows 1 000 mm apart. In order to obtain leaf numbers of 320 000 and 480 000 per ha the plants spaced at 250 mm were topped to 8 and 12 leaves per plant and those spaced at 500 mm to 16 and 24 leaves per plant. The results show that the densely spaced and deeply topped Burley plants are capable of higher production. The conventional procedure (500 mm espacement and 24 leaves per plant) proved greatly inferior.

Turkish tobacco

Where labour is increasingly scarce and wages are rising all the time labour-saving procedures are of great importance. It was found that 500 mm rows produced higher yields than 750 mm rows, and that plant espacements of 100 mm with 14 leaves per plant yielded better than 200 mm with 28 leaves per plant.

As soon as most of the leaves were mature the tobacco was harvested; whole plant harvesting was employed instead of leaf harvesting. The results show that higher production can be obtained from Turkish tobacco in this way.

HARVESTING AND CURING

Flue-cured tobacco

The harvesting, curing and marketing of flue-cured tobacco on the basis of the position of the leaves on the stalk is required at present, mainly because of the major differences in quality between leaves from the various stalk positions. It was found that the harvesting of two, four or eight leaves per picking resulted in no significant differences in price, yield or income per ha. These results were constant over a period of three years.

Where various combinations of harvesting procedures were included, two pickings of eight leaves, or four pickings of two leaves followed by two pickings of four leaves, produced the best results.

Turkish tobacco

Although the harvesting of whole plants requires the least labour, it results in a considerable reduction in yields and loss of income. This finding was confirmed by the results of a further series of trials.

It appears, however, that picking 12 or 16 leaves per plant and then cutting the plant down as soon as the rest are mature produces virtually the same yield and income as the conventional method. These results were not significantly affected by seasons or differences between cultivars.

BULK CURING

Flue-cured tobacco

Various bulk curing techniques were investigated; a special study was made of the effect of various relative humidities on the respiration rate and colouring of tobacco during maturation. Although the results of 3 moisture levels investigated revealed no significant differences in respect of quality, there were significant differences in the colouring periods. Tobacco which coloured at 80 per cent relative humidity took 48 hours on the average to develop its full colour; at the higher moisture level of 95 percent relative humidity the tobacco took an average of 72 hours to reach the same colouring stage. The moisture level of 80 per cent relative humidity during colouring also produced tobacco of the best quality.

Whole-plant harvesting and curing of tobacco plants was studied. Apart from the reduced kiln capacity, poor curing results were obtained as a result of technical problems.

With a view to the complete mechanisation of tobacco harvesting in future, the curing of chopped leaves with or without stems in bulk curers was investigated. Curing trials were undertaken with various containers. Although the curing results are promising, further attention will have to be given to the design of containers to ensure the even circulation of air among the chopped leaves during curing.

Burley tobacco

The curing of Burley tobacco in bulk curers was studied. The results were very poor in respect of colour and quality, owing to technical problems encountered in controlling the moisture and temperature in the kiln. Further research is planned.

CULTURAL METHODS

Chemical sucker control

The fatty alcohol compounds such as Off-Shoot-T, Sprout Off, Antac, Fairtac and Chemical Finger provide outstanding sucker control with no scorching of the leaves if they are applied correctly. Preliminary trials have also shown that tobacco plants can be chemically topped at the same time and suckers controlled if the fatty alcohol compounds are sprayed over the growing points of untopped young tobacco plants.

Preparations such as Pay-Off and Tamex do not kill the suckers but merely suppress their development.

Chemical weed control

The registered chemical weedkillers Planavin, Tillam and Paarlán provide good control of annual grasses, but not of certain broad-leaved weeds. One mechanical hoeing is required to prevent these weeds from multiplying. This hoeing should take place from 4 to 6 weeks after transplanting. Tillam provides good control of nutgrass.

Irrigation

Trials have clearly shown that the moisture status of the soil has an important effect on the root development of tobacco plants. Tobacco which received very little irrigation wilted at a lower soil moisture percentage than tobacco irrigated more regularly. The root development of tobacco irrigated very regularly was shallower and consequently such tobacco started showing signs of wilting at relatively high soil moisture percentages.

Waterlogging as a result of abundant rains did not occur in tobacco irrigated regularly, but tobacco irrigated at infrequent intervals did become waterlogged. Irrigation programmes should therefore be planned with a view to preventing severe drying out of the soil.

QUALITY STUDIES

Reconstituted tobacco

Waste such as mibribs, stems and scrap tobacco is being processed for use by the industry on an increasing scale in order to keep production costs and losses down. Trials were carried out in which fresh, matured tobacco leaves and dried stalks and scrap tobacco were processed into reconstituted tobacco.

Maturing green flue-cured tobacco

Greenness in tobacco as a result of incorrect curing techniques can be largely corrected by means of a fermentation process. It was found that the maturation of green tobacco can be continued under controlled conditions by conditioning it to 15 per cent leaf moisture, baling it and placing it in a fermentation room at a temperature of 50 °C and a relative humidity of 80 per cent for three to five weeks, depending on the intensity and the amount of green.

After the curing season bulk dryers can profitably be used to treat the tobacco for from four to seven days at 24 per cent leaf moisture and a temperature of 50 °C. Under these conditions there is a slight loss of dry matter (1 to 2 per cent) as a result of respiration, but there was a considerable improvement in quality and valuation.

Nornicotine status of breeding strains

The nornicotine and nicotine contents of 25 tobacco breeding strains were investigated with the aid of a gas chromatograph. Although the proportion of nornicotine to nicotine should not be higher than 10 per cent, it was found that the proportion in all the breeding strains varied from 2 to 7.5 per cent. The results have contributed to the evaluation of tobacco breeding strains in the breeding programme.

DISEASES AND PESTS

Black shank

Well-known soil fumigants such as methyl bromide, DD, EDB, Basamid and Di-Trapex

provide virtually no control of the black shank fungus on black turf soils. The systemic preparation Previcur did provide good control, however, and the contact preparations Terrazole and Difolatan warrant further investigation.

The natural infection of breeding strains picked up from infected soil was virtually identical to artificial infection produced in the glasshouse. The artificial infection techniques used at present can therefore safely be used in the development of resistant tobacco breeding strains.

Black root rot

In black turf soils methyl bromide fumigation provides no control of the black root rot fungus. It was also found that the promising preparation benomyl is fungistatic and not fungicidal.

Brown spot

This disease caused considerable damage on several farms during the past season, even attacking flue-cured tobacco, where it is generally no problem.

No reliable infection technique could be developed.

Kromnek

Characteristic symptoms of kromnek were obtained in the glasshouse at temperatures from 25 °C to 30 °C. When the temperatures changed a deviation from the characteristic symptoms was observed. *Datura stramonium* and *Petunia* can be used as indicator plants for identifying kromnek.

American bollworms and cutworms

Cultures of these pests were successfully maintained by artificial means. The life cycle of these pests can now be studied.

Wireworms

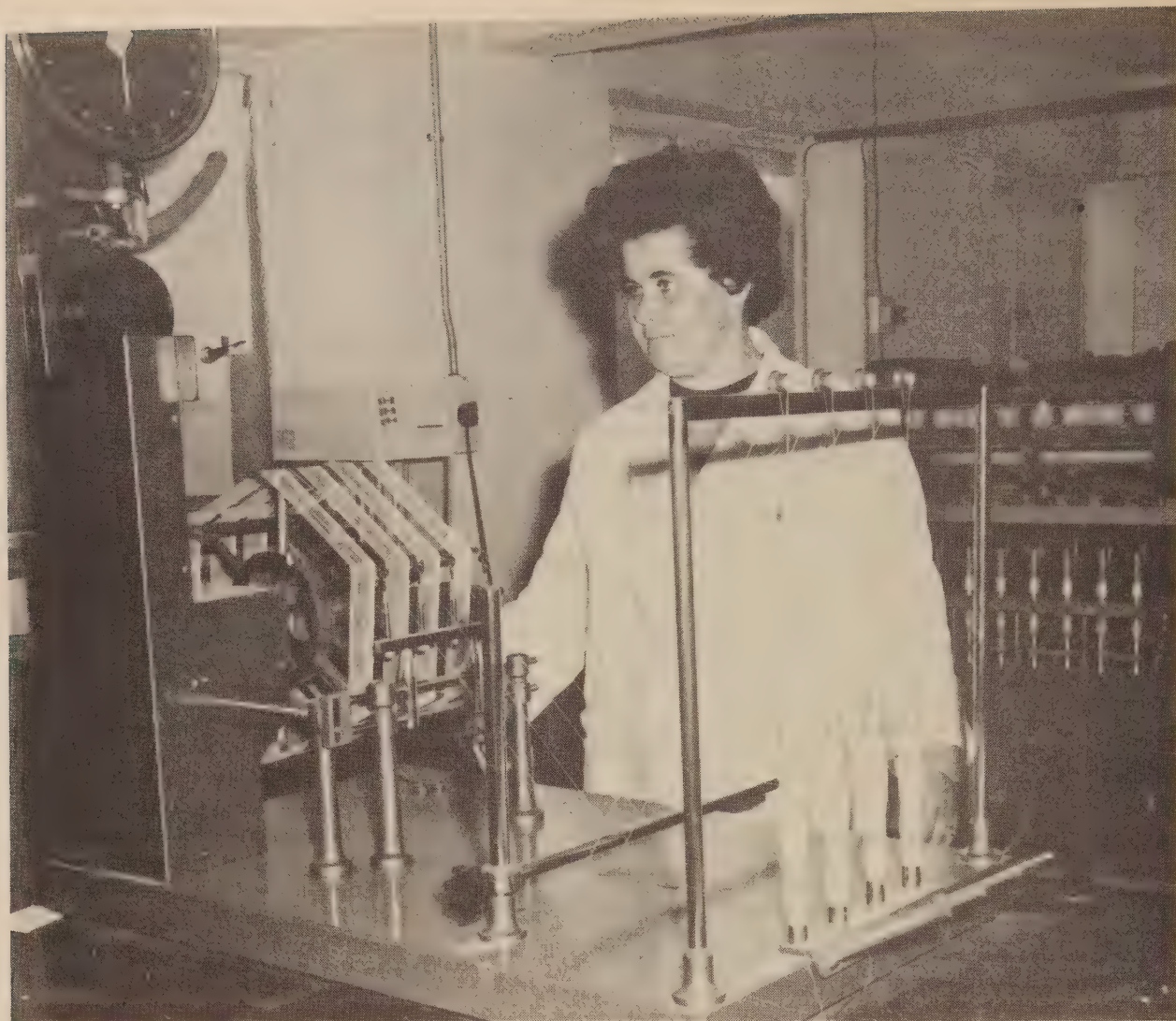
During the past season there were several outbreaks of wireworm and false wireworm infestation and considerable damage was done by these pests. Good control of wireworms was obtained with tetrachlorvinphos, chlorpyrifos, monocrotophos and diazinon.

Cigarette beetle

Notwithstanding regular spraying programmes at co-operatives and on farms, this pest is not being effectively controlled. Since the development of a new control programme at the MKTV in 1972/73 there has been a considerable decrease in cigarette beetle numbers at that co-operative. The control programme comprises firstly stricter sanitary measures and secondly the treatment of floor and walls with 50% WP tetrachlorvinphos.

Nematodes

Pure cultures of *Meloidogyne incognita* and *Meloidogyne javanica* are at present being used for



This apparatus in the cotton fibre laboratory of the Department is used to determine the breaking strength of cotton thread

breeding tobacco cultivars that will be resistant to this pest. Reliable artificial infestations that can be replicated are being obtained in the glass house. The nematodes were successfully kept alive during the winter months with the aid of a heating cable.

COMMODITY EXTENSION

During the year under review farmers' days and discussions on the various aspects of tobacco growing were held in the tobacco production areas on 27 occasions. About 1 015 farmers participated and 9 officers of the Institute acted as speakers.

SOIL AND PLANT ANALYSES

The Routine Analysis Division analysed 9 826 plant, soil and water samples during the year under review. About 51 000 analyses were carried out, which made experimental data easier to interpret.

COTTON

Owing to poor growing conditions only 93 000 bales of lint (expected crop 126 000 bales) was produced during the 1975/76 season. Despite

the fact that the quality of the crop was generally disappointing, no sales problems were experienced according to the Government Cotton Grader.

Breeding and selection - Two breeding strains developed from Acala SJ-1 at Upington appear promising for the Lower Orange and Limpopo Valley areas. They are both susceptible to *Xanthomonas malvacearum*, but tolerant of the fungus *Verticillium dahliae*. Commercial spinning and weaving tests will be carried out on the lint of both cultivars next season and will be decisive in determining whether they will be released as commercial cultivars.

At present there are two selections in the Departmental breeding programme, one from an Albar x North Carolina Margin and the other from an Albar x North Carolina Margin x Acala 442 crossing, that appear particularly promising for the Loskop area. The performance of these two strains will now be studied under commercial cultural conditions before an application for final registration is made. Large-scale trial plantings are being undertaken with these two breeding strains at present.

In the Departmental breeding programme the development of okra-leaved high quality strains is now in the final stages, and the breeding of nematode- and bollworm-tolerant types has begun.

The required buildings and facilities have been created at the Loskop Research Station so that the equipment for lint tests can be moved from Pretoria to Loskop.

Fertilising - In a soil depletion study with wheat as the winter crop and cotton the summer crop a response is still being obtained with nitrogen fertilising. The trial has been in progress for 5 years and will be continued.

Harvesting methods - Mechanical picking studies have shown that the new breeding strain Alma C543 compares well with Deltapine and Acala 1517-70 from the point of view of mechanical harvesting. This is a promising strain for the areas where the quality of Deltapine creates problems.

Diseases and pests - It was found at Upington that damage to cotton seedlings by *Rhizoctonia solani* is less than in the presence of cotton, wheat, oats and maize residues.

GROUNDNUTS

The past season was one of the poorest for a long time for the production of groundnuts. Abundant rains, especially during the last part of the growing season, resulted in an outbreak of leaf diseases on an unprecedented scale. The incidence of leafspot *Cercospora* and leaf blotch *Phoma arachidicola* resulted in defoliation of the plants at an early stage of growth, under both dryland and irrigated conditions. In a field trial at the Dundee Research Station weekly spraying with a mancozeb/benomyl mixture raised kernel yields from 943 kg per ha to 1 617 kg per ha. Hay yields increased from 894 kg per ha to 1 266 kg per ha. The cool, moist conditions experienced in most production areas were highly conducive to grey mould *Botrytis cinerea*.

Intensive growth studies at Potchefstroom underlined the importance of controlling leaf diseases. It was found that kernel masses show a rectilinear increase until very late in the growing season. In practice groundnuts are often harvested as soon as leaf losses start to occur as a result of leaf diseases. This means that the increase in kernel mass late in the season is not utilised.

Cultural trials carried out at Potchefstroom showed that if the plants are covered as a result of hoeing the development of flower primordia is seriously impaired. The greatest damage is done when cultivations of this type are carried out at an early stage of development. Earthing up at later stages has less effect on flower development and fruit formation, but is conducive to fungus diseases.

The groundnut cultivar Sellie which was released by the Department is performing very well, both under irrigation and in dryland conditions. This cultivar was evaluated in small plot yield trials and larger scale plantings. An outstanding characteristic of the cultivar is the unusual regularity of kernel shape and uniformity of kernel

quality at all the localities where the trials were carried out. Several other promising new breeding strains have been obtained from the breeding programme and are being evaluated on a larger scale in yield trials at present.

An investigation into the variation in yield potential of commercially available groundnut seed revealed the disturbing fact that seed samples known as Natal Common vary greatly in yield potential. The difference in yield between the new cultivar Sellie and the poorest seed sample was almost 1 000 kg of kernels per ha. Every effort is being made at present to multiply Sellie seed as rapidly as possible.

SUNFLOWERS

The growing interest in sunflower production in South Africa is reflected by the increasing scale of research on this crop.

Forty-two cultivars were evaluated in the national cultivar trial programme. These trials were standardised according to a guide specifically drawn up for the purpose. The trials were very effective and the results so reliable that it will be possible to reduce the number of entries by over half next season.

Intensive fertilising and plant nutrition studies were carried out on sunflowers at the Dundee Research Station. The problem of growing sunflowers on acidic soils is receiving special attention. Yields were boosted by an average of 12 per cent for every 0,1 me per cent reduction in exchangeable aluminium. Liming to a pH of 4,5 (measured in NKC1) on an Avalon medium sandy loam and the application of 10 kg of borax per ha raised seed yields from under 100 kg per ha to over 1 200 kg per ha.

The most important growth and yield characteristics of the most popular cultivars are being intensively studied in a growth analysis trial at Potchefstroom.

DRY BEANS

The Department's dry bean breeding programme has been very successful. Five strains which performed very well in the national cultivar trial programme were registered as cultivars. The breeding programme is being continued and at present there are 136 strains in the F7 generation being multiplied for evaluation in yield trials.

A scheme for the production of high quality disease-free dry bean seed has been worked out and the first phases of this programme have already started.

Seed-borne bacterial diseases have caused enormous crop losses in beans over the past few years. It has become clear that the only effective method of control would be to make bacteria-free seed available to farmers. The Plant Protection Research Institute has therefore started purifying small quantities of seed of the most important bean cultivars from bacterial pathogens. The intention is to multiply this seed under the aegis of the Dry

Bean Board and eventually make it available to the producer.

SOYA-BEANS

A world-famous expert on soya-beans, Dr E.E. Hartwig, from the American Department of Agriculture, visited South Africa in March 1976. After visits to the main soya-bean production areas, Dr Hartwig made recommendations on improved cultural techniques and possibilities for cultivar improvement.

A collection of 91 promising new breeding strains supplied by Dr Hartwig is being evaluated locally at present. It is hoped that the use of cultivars with a more determinate growth habit will solve the serious practical problem of lodging during the pre-harvesting stage.

Observation plots were planted to the most popular American cultivars at various localities with a view to determining adaptability. Seed of the most promising cultivars will be retained for planting on a larger scale.

CHICORY

With the higher producer price as an incentive, producers expanded the area under chicory considerably during the year under review. Notwithstanding unfavourable production conditions during the season, it was possible to meet the local demand and a surplus of about 1 million kg of dried root is anticipated. There was an increase in the area under chicory, especially in the Paterson area.

Top priority in the chicory research programme is being given to the chemical control of weeds. The programme aimed at producing chicory seed locally is continued, and work on the mechanical harvesting of chicory, in which the Division of Agricultural Engineering and a local engineering firm are co-operating, is in progress.

The adaptability of various imported chicory cultivars is being investigated, both at Bathurst and by certain co-operatives.

Breeding and selection - The results of cultivar trials carried out over the past four years show that chicory grown from locally produced seed produced the highest yield on the red soils of the Alexandria-Bathurst area.

Attempts to stimulate chicory roots to produce seed by means of cold treatment have been unsuccessful so far. The possibility of using hormone treatment to stimulate plants in the production area to produce seed is being investigated in co-operation with Rhodes University.

The use of pelleted chicory seed, planted by means of precision planters, has increased considerably. This planting method is very successful, especially where sufficient moisture is available. The advantages of this method are, however, often cancelled out by the practice of planting on a ridge, which dries out faster.

Cutworms did considerable damage in germinating stands during the year under review. The damage was so severe that large areas had to be replanted. Farmers who followed the recommended practice of strewing bait suffered little damage, however.

Harvesting methods - A local engineering firm is working on the development of an implement to harvest chicory mechanically. The project is being continued and appears very promising.

Trials aimed at finding a suitable selective weedkiller for use on chicory were continued. Thirty-eight products were eliminated after screening and a number of unregistered products are being tested at present.

Six preparations, namely chlorpropan, alachlor, pyrazon, pronamide, dimitramine and verizar have been approved for further investigation in trials on various soil types, with planting times that will cover the entire spectrum of winter and summer weeds.

An important goal was achieved with the establishment of a chicory production study group in the Alexandria/Grahamstown/Bathurst area. The group has already started various programmes, such as a programme on chicory fertilising and a survey of the weed spectrum.

Liaison and co-operation with the Chicory Control Board and the Chicory Commodity Committee of the East Coast Agricultural Union have been placed on a sound footing. The officer responsible for chicory research was co-opted as a member of the Control Board.

A field husbandry specialist will undertake a study tour to four European countries to investigate chicory research and cultivation.

ARTIFICIAL PASTURES AND FORAGE CROPS

LUCERNE

The national lucerne breeding programme was expanded and breeding more specifically for acid-tolerant types was undertaken. The main type used is the prostrate lucerne selection *Medicago falcata*, which bears yellow flowers. Promising results from the point of view of increased production under acidic soil conditions have already been obtained.

Owing to the poor seed crop the Lucerne Seed Control Board has been compelled to import 5 000 bags of seed of the American cultivar Moapa 69. This cultivar did well in previous cultivar trials, but during the last season of a trial period covering four seasons it produced lower yields than S.A. Standard.

Despite a poor season for seed production, good seed yields were obtained on the Cradock experimental plot by applying improved seed production techniques. These techniques include planting in rows, soil cultivation between rows, providing up to 10 beehives per hectare to ensure an adequate supply of pollinators, the chemical defoliation of lucerne when 60 per cent of the pods

are dark brown and the direct combining of the seed. These techniques make it possible to raise seed production by 90 per cent.

A trial to study the effect of the quantity and frequency of irrigation on seed and hay production is in progress at Oudtshoorn. The following conclusions can be drawn from the results of the first year:

1. Irrigation when the lucerne is in full bloom has an adverse effect on seed production.
2. January and February are more suitable for seed production than November and December.
3. Hay production can be boosted by irrigating twice during the production period instead of applying the same amount of water at a single irrigation.

A fertilising trial at Oudtshoorn showed that potassium and phosphate fertilising affects seed production, but more information is required before final conclusions can be drawn.

During the 1975 winter the lucerne earth flea and the black sand mite again occurred in pest numbers on lucerne-clover pastures. The Caledon-Riviersonderend area was particularly badly affected. *Anystis* sp. A appears to be the most successful of the predatory mites for purposes of biological control. The way this predator establishes itself, multiplies and spreads is being studied at present.

A localised outbreak of the small armyworm destroyed about 30 ha of lucerne-clover pastures in the Bredasdorp district and the Egyptian cotton leafworm did considerable damage to lucerne near Brits.

Lucerne cultivation has expanded in the Barkly East district. At present 39,7 per cent of the dry lands and 81,3 per cent of the irrigated lands are under lucerne, as against 16,7 per cent and 56,4 per cent, respectively, in 1971. Cold-resistant lucerne strains are being evaluated there in co-operation with the Karoo Region.

TRITICALE

In a series of trials the grazing potential of triticale was compared with that of oats and wheat in both dryland and irrigated conditions.

Taking the green matter yield as the criterion, both oats and wheat produced higher yields than triticale under irrigation at Cradock. The highest yield of oats was 27,1 tons per ha, as against 19,16 tons per ha of triticale.

After a single grazing at a height of 300 mm, triticale produced the highest seed crop. Comparative figures for triticale, oats and wheat were 2,47, 1,64 and 1,83 tons per ha respectively.

Under dryland conditions at George, where four cuttings per season were obtained, oats again yielded better than triticale. Comparative green matter yields were 23,112 tons per ha for oats as against 13,26 tons per ha for triticale. After a single grazing wheat and oats produced a higher seed yield than triticale.

Under the drier conditions at Bredasdorp there were no significant differences in the green matter yields of oats and triticale.

NITROGEN FIXING IN GRASSES

The investigation into nitrogen fixing in grasses is being extended to cover all the major artificial pasture grasses and identify all the factors that could play a part.

Active nitrogen fixing has been observed in several grasses and other field crops, and deliberate breeding or selection for this property offers great practical possibilities.

CENCHRUS CILIARIS

The research programme on evaluating buffalo grass is being continued.

The fertilising levels that produce the highest dry matter yields have not necessarily proved to be the most economic. The programme is being adjusted so that the most economic use of fertilisers will receive attention.

An investigation carried out by the OFS Region has indicated that the crude protein content, digestibility and voluntary intake of *Cenchrus ciliaris* hay by sheep, drop sharply when the hay is cut during the later stages of the growth cycle.

ANTHEPHORA PUBESCENS

The production potential of certain *Antheophora pubescens* selections compares very favourably with that of *Cenchrus ciliaris*. Maximum yields under dryland conditions at Vaalharts were 7,00 and 7,75 tons per ha, respectively, for the two species.

In view of the high production potential of *Antheophora*, and properties such as easy establishment on a variety of soil types, relatively low nutrient requirements, high palatability and drought resistance, this grass holds great promise for the extensive bushveld areas.

A comprehensive evaluation programme similar to the *Cenchrus* programme was launched during the year under review.

GRASS-LEGUME PASTURES

In a grazing trial on grass-legume pastures near Riviersonderend a grazing pressure of five ewes per ha was too low to show up differences between treatments. The pastures were underutilised, especially during the optimum growing period, and this had adverse effects on both the animals and the grazing.

The low grazing pressure was responsible for all the ewes being unnecessarily fat, which led to low and erratic lambing percentages. The programme to measure pasture production in various climatic situations is being continued. New techniques for the continual adjustment of the grazing pressure are being used in the programme.

The effects of spraying with pronamide to eliminate the problem grasses *Hordeum murinum*

and *Bromus diandrus* were still discernible after a full season.

FORAGE SORGHUM HYBRIDS

In a planting time trial with forage sorghum hybrid cultivars at Glen the slow, thick-stemmed, tall cultivars such as Sorghum 944 produced the highest yield (21 tons per ha) with early planting and 2 cuttings at the peak flowering stage. When the cultivars were planted around the middle of the planting season only one cutting was obtained at the peak flowering stage, with one cutting of regrowth. In this case the cultivars with stems of medium thickness produced the best yields; Haygrazer, for instance, produced 8,5 tons per ha.

With late planting only the thin-stemmed, fast growing hybrids such as Trudan II attained the peak flowering stage and with only one cutting the best yield was 2 tons per ha.

The sorghum hybrid Haygrazer was chopped at the green stage and fed to dairy cows in order to determine its potential for milk production. At an average daily intake of 34 kg of green matter (8,3 kg of dry matter) the digestibility was such that this quantity was able to provide the maintenance requirements of the dairy cows, even when it was the only source of roughage.

WINTER GREEN FEED

Twelve cultivars comprising winter cereals and Italian rye grasses were evaluated at Kokstad, both under irrigation and in dryland conditions, for the production of winter green feed. These cultivars were planted during mid-February, mid-March and mid-April.

Late plantings, especially April plantings, produced lower yields. Under irrigation the rye grass cultivars produced higher yields than the others throughout. Under dryland conditions some of the oats cultivars produced the highest yields in dry years, but in good seasons the rye grass cultivars, especially Midmar, did best.

Midmar is the only locally bred rye grass cultivar which is included in the varietal list and seed will be made available on a commercial scale during December 1976.

DROUGHT FORAGE CROPS

Interest in the planting of spineless cactus now centres around fruit production rather than forage production. Because the past year has been very wet a few fungi have appeared on cactus and caused losses, and the severe cold of the past winter also took its toll.

Interest in planting saltbush, especially oldman saltbush *Atriplex nummularia*, is increasing. During the year under review 920 kg of oldman saltbush seed was made available to farmers. In the Sandveld of the Winter Rainfall Region oldman saltbush is very successful when planted as a permanent windbreak - one which can provide additional grazing at the same time.

The programme for increasing the palatability of oldman saltbush through selection is progressing satisfactorily. After a population had undergone selection for palatability for two generations, it was up to six times as palatable to sheep within the first three days of grazing as the base population.

The grazing trials also revealed that oldman saltbush, with the addition of a small energy supplement, can meet the requirements of pregnant ewes and wet ewes up to weaning.

OTHER CROPS

Two quick grass species, namely star grass *Cynodon nlemfuensis* and Coast Cross 2 *Cynodon* sp. show considerable potential for beef production and wide adaptability in the drier areas of the Natal Region. They are popular among local farmers and plantings are being expanded all the time.

Coast Cross 2 also produced good results in the Highveld Region, where very high mass increases per ha were obtained with oxen on a soil of the Glendale series.

In an overseeding programme at Potchefstroom crops such as *Digitaria smutsii* and lucerne established very well on soils of the Glendale, Williamson and Gelykvlakte series. Where the mass increase of stock per ha are taken as the criterion of production, the best results were obtained on the Glendale series and the poorest on the Gelykvlakte series.

5. Horticulture

DECIDUOUS FRUIT

WINTER RAINFALL AREA

APPLES

The first series of inoculations of apple seedlings cultivated for resistance to apple scab has been completed and approximately fifty per cent of them were found to be resistant. From a crossing of Golden Delicious and Cox's Orange Pippin, 44 seedlings were provisionally selected.

Attempts to stimulate adventitious budding in Granny Smith appear promising now that the root development of this cultivar has been stimulated. Evaluation of the early red apple selection E14/12 was continued and co-operative evaluation will be undertaken on a large scale in the coming season.

Rootstocks

There are indications that trees of the Golden Delicious and Granny Smith cultivars on M26 rootstocks remain much too small under Elgin conditions to compete with the above-mentioned cultivars on Merton 793 as regards production. The vigorous rootstocks MM104 and MM109 produced more per tree than M7 and MM111, but this situation is expected to be the reverse per unit of area at a later stage.

Planting methods

By means of severe pruning to limit tree height, Golden Delicious and Granny Smith trees (12 m x 3 m palmette) may be kept within bounds without the fruit being adversely affected by overshadowing. In this trial, as previously, the planting distance proved to be more important than the training system for determining crop mass.

New standards for leaf composition of apples

Leaf analysis surveys in optimum orchards in the three principal apple regions in South Africa, namely Elgin, Langkloof and the Kouebokkeveld of Ceres, made it possible to lay down the following new standards for leaf composition:

N 2,10 to 2,80%	P 0,13 to 0,19%	K 0,80 to 1,60%
Ca 1,20 to 1,60%	M 0,30 to 0,50%	Ma 20 to 90 ppm
Fe 80 to 150 ppm	Cu 5 to 10 ppm	Zn 10 to 40 ppm

More accurate conclusions on the nutrient status of apple trees can be made from now on with the aid of these new standards.

Effect of autumn nitrogen application and DNOC winter oil spraying of young apple trees in sand cultures

Inadequate autumn nitrogen applications speeded up leaf drop and resulted in a low reserve. As a result, the rapid development of new growth the following spring was drastically affected. This retarded the sprouting of buds and partially suppressed the dormancy-breaking effect of DNOC winter oil spraying. The total fruitset was higher in the case of trees receiving full autumn nitrogen applications and a DNOC spraying. Flowers which opened after the middle of November had a very poor set.

By means of good post-harvest treatment, especially with nitrogen, farmers ensure large crops and the alternative bearing of trees is reduced.

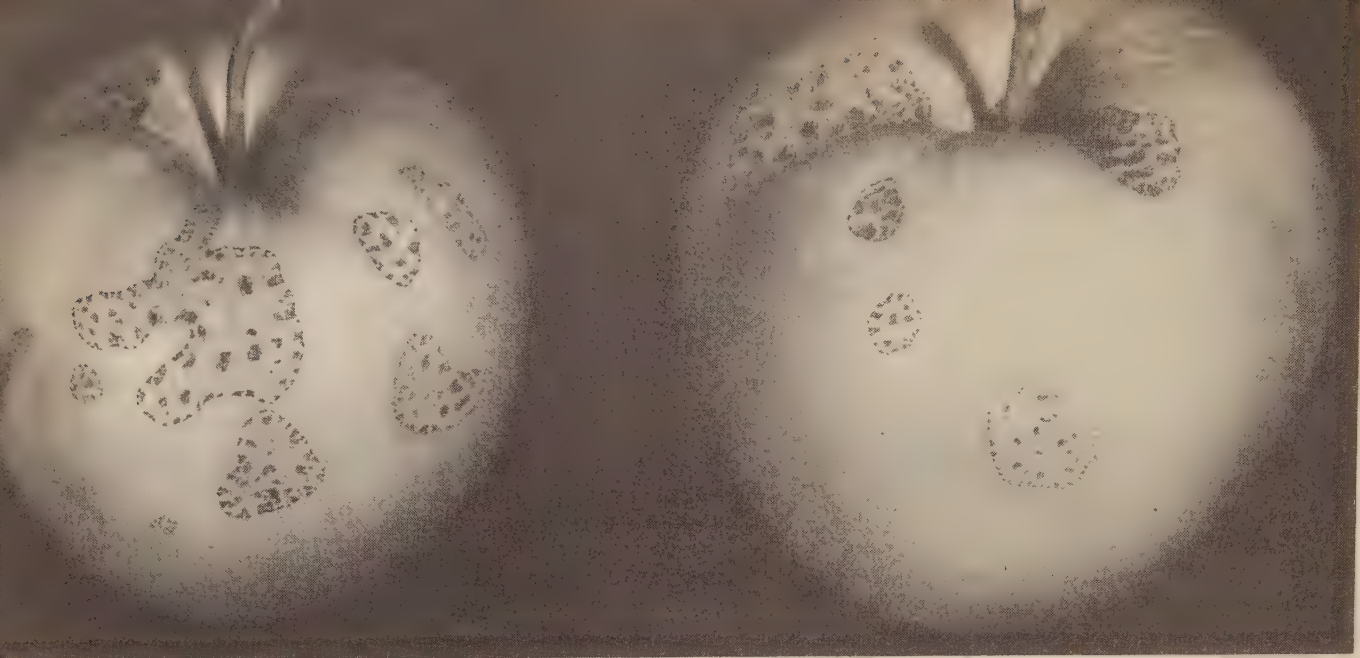
Bitter pit

The very important bitter pit problem was given intensive attention. In a field trial with mature Cox's Orange Pippin apple trees the effect of three pruning methods, namely normal winter pruning, regeneration pruning and summer pruning, on the intensity of bitter pit were investigated. Summer pruning and winter pruning resulted in the lowest and highest intensities of bitter pit, respectively.

It was found that environmental conditions after harvesting influenced the development of bitter pit. Of the Winter Pearmain apples packed for export and stored at -0,5 °C for five months, 23,6% developed bitter pit, while only 8,7% of similar apples stored in crates for the same period and in the same cold store developed bitter pit. This type of packing has an effect on the rate of precooling, and there is every indication that this factor probably plays a role in post-harvest bitter pit.

By treating apples with a 2% calcium chloride solution after harvesting the percentage of bitter pit was halved. Research into this aspect is being continued, so that this treatment can be recommended in practice.

The effect of wetting agents on the pre-harvest intake of calcium 45 was also investigated. Of the seven wetting agents tested six significantly suppressed the calcium intake of apples while only one significantly increased the calcium intake.



Damage caused to apples by snout beetle

Fusicladium

It has been proved that *Venturia inaequalis* has become resistant to benzimidazole fungicides on certain farms in South Africa. Both stages, the sexual as well as the asexual phases, were resistant. For effective control of the disease on these farms, benzimidazole spraying should therefore be stopped or alternated with fungicides not belonging to the benzimidazole group.

Low volume spraying

Large-scale trials show that spraying with an oil-water emulsion of 75 to 80 litres at a half dose of the active pesticide per hectare, controls most diseases and pests on pomes as effectively as high-volume applications at full dose. Residue studies have shown that if a half dose of pesticide per hectare is used the residue resulting from this method of application is not higher than that resulting from high-volume applications. This method of application will therefore in no way lengthen the safety period for the pesticides used at present. The general use of this method could result in considerable savings.

Snout beetles

The resurgence of snout beetles, apparently as a result of less use being made of DDT, will be aggravated by the withdrawal of this insecticide from the market and research on alternative insecticides to control them is essential. As a result of this research one insecticide has already been registered for the control of snout beetles in apple and pear orchards. Three other promising insecticides have also been found.

Orchard mites

An easier and more practical method of accurately detecting mite populations in orchards with the naked eye instead of by means of a microscopic examination of leaf samples has been devised. With this method miticide sprayings can be kept to a minimum in order to achieve integrated control and to save on spraying costs.

Pest control

Trials in connection with pest control for both apples and pears were continued, with special reference to codling moth control. An important monitor system, based on the use of sex traps and worked out in preliminary trials was tested in more than 400 orchards. By means of large-scale inspections of fruit at harvesting time it was confirmed that the system is practical and that large savings on spraying costs are possible without crop losses. It was found that in most cases an average monitor area of 2 to 3 hectares per sex trap was satisfactory. In many orchards the number of codling moth sprayings were reduced to such an extent that the control of orchard mites was greatly facilitated.

Ethoxyquine damage

Overseas it was found that when apples are treated against superficial scald with ethoxyquine, scald damage occurs after the ethoxyquine suspension or the treated apples have been exposed to sunlight. This aspect was thoroughly investigated in South Africa but no scald damage was found when ethoxyquine was left on apples for five hours after which they were exposed to direct sunlight. There are indications that scald is caused if the

ethoxyquine mixture was not stirred thoroughly before use or when very old ethoxyquine is used.

considerable improvement on the products available at present.

PLUMS

One provisional selection from Golden King has dessert possibilities. Large-scale co-operative plantings of five promising prune selections are being planned and meanwhile new crossings are being made for further evaluation, the purpose being to find more cultivars that are resistant to black spot of plums and which also produce fruit of higher quality.

Control of ripening of Santa Rosa plums

It has been established that earlier and more uniform ripening of Santa Rosa plums is possible by spraying them with the growth regulator ethephon at 100 ppm, approximately 14 days before harvesting. The advantages to the plum producer are that fruit can be marketed earlier and fewer pickings are needed to harvest the crop.

Canning of Songold plums

During the 1974/75 season it was found that Songold plums had canning possibilities but during processing the fruit tended to fall apart. During the past season it was found that fruit with an internal pressure exceeding 3 kg remained intact during the canning process. The addition of small quantities of calcium chloride gave a firmer texture but most judges preferred the fruit without added calcium chloride and also felt that this was a product that would sell well. The new product is in any case a

PEARS

One provisional selection, from a crossing of Bon Chretien and Clapp's Favourite, offers the possibility of an early dessert pear cultivar of much higher quality than Clapp's Favourite being available in the near future. The latter cultivar has poor dessert qualities and a short storage and shelf life.

Cultivation and fertilisation

The investigation into the causes of poor fruitset of Packham's Triumph was continued. Attention was given to post-harvest application of nutrients, especially nitrogen, but without positive results. There are, however, clear indications that severe pruning just before flowering and drastic checking of the growth of young trees, without reducing the fertilisation, could improve fruitset.

Rootstocks

In a trial planting of Bon Chretien and Packham's Triumph grafted on various rootstocks, Bon Chretien trees gave their first noteworthy crop. The productivity of this cultivar on the various rootstocks showed the following pattern: On BP1, the locally bred rootstock, gave the highest production, followed by B14, BP2, Saailing, Kweper A, B22, and B27. Kweper A is the most dwarfing rootstock and Saailing and BP2 are the strongest of the rootstocks in the group.



Three types of snout beetles that are important pests of apples and pears

Spoilage of Packham's Triumph

There are indications that fruit spoilage in the orchard, like bitter pit among apples, is accompanied by excessively lush growth, a low Ca content of soil and a low Ca/K ratio in the fruit and leaves. Positive results were obtained with five successive Ca sprayings. It is foreseen that an increase in soil Ca, a limiting of the K application and growth control will eliminate this problem.

PEACHES

From crossings of Elberta and Oom Sarel, as well as Selection 54/31, a large number of yellow-fleshed seedlings were obtained of which 20 seemed promising.

Evaluation of new cultivars and selections continued, and a very early yellow-fleshed dessert type, Selection 10/1, seems promising. It will now be further tested under semi-commercial conditions.

Rootstocks

Experience during the past season showed that Okinawa and Nemaguard rootstocks are very sensitive to wet conditions. They can, therefore, only be used in particularly well-drained sandy soils. Culemborg or Kakamas on "varkperske" still gives the highest production and it is clear that this rootstock deserves more attention.

Summer pruning

By means of summer pruning after harvesting (from the end of February) instead of winter pruning, success has been obtained in limiting overshadowing and reducing bud drop in peaches. Dense plantings of peach trees to obtain earlier economical crops was made possible by following a summer pruning regime. In this way the size of the tree can be limited and better light is provided, which results in larger crops and more uniform ripening of the fruit.

Composition of clingstone peaches

It was found that the cultivars Oom Sarel, Prof. Neethling and Kakamas have a somewhat higher vitamin C content than is usually found in peaches. Peeled peaches have less vitamin C than unpeeled peaches. The changes in vitamin C content during three months' cold storage at 0,5 °C varied considerably. The average decrease in vitamin C content for all three cultivars was, however, in excess of 30%. Of special importance is that nutritional value does not drop drastically after processing.

Wound dressings

Because of the limitations of wound dressings a new type has been developed. This wound dressing contains two fungicides with an activity spectrum which will effectively control all wood rot pathogens associated with the deciduous fruit industry. The wound-sealing characteristics of the

dressing are also better than those of wound dressings currently in use. Of special importance is that no cracks appear in such a wound dressing after a time. By using this wound dressing producers should find it easier to lengthen the production life of trees.

Mass breeding of fruit flies

Methods and techniques of mass breeding of fruit flies in laboratories have advanced to such an extent that hundreds of thousands of flies are available at any time for radiation and/or cold storage sterilisation trials for exporting certain South African deciduous fruits to countries where this pest is not found.

APRICOTS

Seven provisional selections have dessert possibilities. Selection 36/39, which has shown promise in the past, is doing well this year as a canned product and has elicited very favourable comments. The canned product looks very attractive. Although it is a little sour, an overseas consignment elicited encouraging comments on its dessert qualities. The release of this selection as a canning cultivar is being considered.

STRAWBERRIES

Selections 71/7 and 71/8 again did well as far as fresh-storing and freezing are concerned. Production of both is as good as that of our best commercial cultivar, Parfaite. These selections were planted out in co-operative trials for final evaluation.

Exports by air - The packing of strawberries on polystyrene trays, which in turn are packed in a large polystyrene container, is most impractical, especially if large volumes are being handled. A new type of packaging was designed in 1975/76 and consists in the strawberries being packed in plastic-ribbed punnets after which they are covered with plastic wrap to prevent shifting. Eight punnets are placed in an attractive, well-ventilated carton, pre-cooled and then packed in an unventilated cardboard container on a returnable pallet. The container fits in the hold of the Boeing 727, the Boeing 737 and any other aircraft which transport perishables overseas. This type of packaging has met with favourable comments on all sides.

Results during 1975/76 have shown that the Parfaite cultivar can be packed in double layers and still arrive in Europe and Britain in very good condition. Very favourable comments on the quality and packaging have been received from overseas.

SUMMER RAINFALL AREA

PEACHES

The peaches marketed earliest fetch the best prices. During the past season the first Earlibelle peaches were sold early in October for R4,00 a 4 kg tray.

The demand for the cultivars bred by the Department was very good. Most big growers sold their entire stock of young trees.

Owing to the high rainfall of the past season, brown rot *Monilinia fruticola* did a great deal of damage, especially to the yellow-fleshed canning cultivars. Fruit that appeared healthy and was treated with preparations for controlling brown rot nevertheless went bad in the trays within 24 hours. As a result consumers became reluctant to buy peaches of this variety and a consumer resistance to Earlibelle as a dessert peach would appear to have developed. This problem has also meant that the demand for yellow-fleshed canning varieties from nurseries has been poor.

In view of this problem it was encouraging to find that the newly bred peach *Imperani* appears to be more resistant to brown rot.

There was a very keen demand for *Imperani* peaches on the Durban market. Peach farmers in the Eastern Free State again harvested a good crop of *Imperani* peaches this year. The cultivar flowers late in August and has consequently borne regularly during the past three years. The fruit is large and attractive, with a very good flavour.

The imported American yellow-fleshed loosestone peach *Dixired* made a very good showing in the Eastern Free State. The cultivar, which was imported for the sake of its late flowering properties, has flowered later than 30 August during the past three years. The fruit was large, round, firm and attractive and ripened from 5 to 12 December. The indications are that the cultivar has a good future in this area.

The industry urgently requires a good quality nectarine that flowers at the end of August and a good dessert peach with an attractive colour and good handling characteristics that ripens from 1 to 20 December.

Breeding and selection

Four selections from the progeny of *Imperani* appeared promising in the Eastern Free State, where late frost is the major problem. These selections not only flower in late August, but produce peaches with a better attachment which therefore do not easily fall from the tree - a problem with *Oom Sarel*, *Keimoes* and *Kakamas*. Furthermore, underdeveloped fruit is not found and the growth habit of the trees is sturdier than that of the yellow canning cultivars.

In the Ficksburg area the selection 69-612 ripened 12 to 14 days earlier than *Oom Sarel*. It nevertheless flowers about a month later than *Oom Sarel* under these conditions.

CHERRIES

A new interest in the mechanical harvesting of cherries has developed and the first harvester was used with a fair degree of success in the Ficksburg district.

Rain, followed by damp, overcast conditions, greatly impairs the keeping quality of cherries and no established cultivar is resistant to cracking.

There are indications, however, that the new red-fleshed cultivar *Van* has a better resistance to fruit cracking.

Wherever new orchards are established there is still a tendency to plant mainly yellow cherries which are suitable for processing.

There were abundant rains for the second successive season and consequently tree losses occurred on poorly drained soils.

Propagation

Propagation studies with cherry rootstocks confirmed that the Mahaleb clone B40 is easier to root by means of hardwood cuttings than ordinary Mahaleb. Good rooting results were again obtained with the Mazzard hybrid Fb 2/58/48; this hybrid has a very strong and well-distributed root system.

The investigation to determine the most suitable winter planting date for hardwood cuttings is continuing. During the past season the best rooting was obtained with transplanting in May, which is contrary to the results of the previous season. The take of cuttings may differ from year to year, however, because it can be affected by the winter climate and the maturity of cutting wood. With Mahaleb, Mahaleb B40 and Fb 2/58/48 rooting was 50 to 75 per cent when the bases of the cuttings were treated with hormone powder or 1 000 ppm of indolebutyric acid.

Mahaleb B40 and Fb 2/58/48 are expected gradually to replace Mahaleb and Mazzard F12/1, respectively, as rootstocks. Sweet cherries have a very good affinity with the Fb 2/58/48 rootstock.

Rootstock trials established in 1973 and 1974 are already showing that, unlike the Mazzard rootstock, Mahaleb and Stockton Morello are overgrown by the sweet cherry, although no differences in tree size have been observed.

During the winter of 1975 virus-tested propagating material from the Cherry Experimental Farm at Ficksburg was issued to approved nurserymen participating in the Cherry Plant Improvement Scheme. The following material was issued:

10 000 buds of cherry cultivars

900 rooted rootstocks

The Cherry Plant Improvement Scheme has now been functioning for three years, but nurserymen are still unable to meet the demand.

NUTS

Most of the pecan cultivars are now 17 years old. The past season's crop was very good. The average yield from the ten highest yielding cultivars this year was 39,2 kg per tree, as against 15,8 kg last year.

Moore again produced the biggest crop - a record yield of 71,0 kg per tree. The nuts were considerably smaller this year than last year. The average nut sizes of Moore and Mahan were 133 and 71 nuts per 500 g respectively, as against 120 and 55 nuts per 500 g the previous season. The following ten cultivars have shown the best results over the past 8 years:

Moore, Bester, HLH B9/2, Success, Barton, Caspiana, Mahan, Squirrel's Delight, Nellis and Burkett.

South Africa imports large quantities of nuts annually. There is no reason why pecan nuts should not be planted on a larger scale in parts of the summer rainfall area that have a Middleveld and Highveld climate and a seven months' growing season. There is an increasing interest in pecan nut production.

STRAWBERRIES

Strawberry production has expanded rapidly since 1970 and there was a considerable increase in the quantity of planting material sold by registered strawberry nurserymen during the year under review. In all 4 616 000 plants changed hands in March 1976. The demand for cultivars was as follows:

Selekta	-	41%
Parfaite	-	41%
Tioga	-	14%
Earlibelle	-	4%

This means that about 66 ha was planted with this planting material. Bearing in mind that many farmers use their own planting material as well, it may be assumed that almost 100 ha of strawberries was planted in the summer rainfall area this year. One farmer who specialises in growing export strawberries planted 35 ha of strawberries, and another is growing about 5 ha of strawberries in plastic tunnels.

Cases of anthracnose in strawberry fruit were reported for the first time.

Virus-free propagating material

Virus-free clones of 20 cultivars and breeding strains for the production areas of the Summer Rainfall Region are being maintained. Under the Strawberry Plant Improvement Scheme about 3 300 virus-free plants were issued to nurserymen in the area as parent plants for multiplication for the industry.

TABLE GRAPES

WINTER RAINFALL AREA

A total of 33 seedlings were selected for further evaluation and five provisional selections merit final evaluation. Two final selections are promising - 17/19 as an early white table grape and B5/36 as a seedless type suitable for drying and storage.

Two imported table grape cultivars, Italia and Cardinal, imported from Italy and the USA, respectively, did so well under local conditions that both have been released for local marketing.

Dan-ben-Hannah, originally imported from Israel, has been placed on the export list as a fullfledged export cultivar.

THE REDLEAF SYNDROME

In a pot trial in sand cultures, proof was found that the redleaf syndrome early in the season may be ascribed to a shortage of either calcium or magnesium or both. In a field trial it was found that this syndrome can be controlled to a great extent by a series of five calcium sprayings from the middle of November to the middle of January. Vines with this syndrome bear hardly any fruit because the canes do not ripen normally.

DISEASES

A new table grape disease, caused by the fungus *Coniothyrium diploidiella* was detected last season in the Hex River Valley on New Cross and Barlinka. The disease is characterised by cankers on the canes and stalks. Cankers on the stalks result in the latter being ringed, which means that the berries wither and dry out. A preliminary survey has shown that the disease is not yet widespread.

CONTROL OF SPOILAGE

Results have confirmed that *Botrytis cinerea* rot of table grapes can be effectively controlled by a combination of pre-harvest and post-harvest applications of fungicides. Packing in polyethylene bags, as against standard export packing without the polyethylene bags, had the following advantages: Less loss of moisture, with the result that each case weighed between 5 and 6% more; greener stalks and firmer berries, and therefore more attractive grapes; the concentration of sulphur dioxide can be reduced from 25% to 8%. The adverse effect of a polyethylene bag, namely that wrapping paper becomes wet and unsightly, was eliminated by wrapping the bunches in cellophane. Grapes thus wrapped were more attractive to the consumer.

PESTS

The availability of a rapid-breakdown insecticide for the control of the vineyard mealybug, largely as a result of local research, has made chemical control of this pest shortly before, or even during, harvesting possible.

Surveys of the occurrence of harmful birds in orchards and table grape vineyards were undertaken on five experimental farms. Various repellants and methods of protecting table grapes were tested. According to observations various harmful bird species occur, but most of the damage is done by Cape sparrows. No success was achieved with repellants. A reasonable degree of success was achieved by protecting table grape bunches with polystyrene shields.

MATURITY STANDARDS

Determining the sugar/acid ratio as an index of table grape maturity is a cumbersome procedure and has to be done in a laboratory, compared with the determining of the total soluble solids (TSS) or



Cancerous wounds on Berlinka shoots caused by the fungus *Coriothyrium diplodiella*

sugar content, which can be read on a simple hand refractometer. The defining of maturity in terms of TSS is much easier and more reliable.

To date, maturity in terms of TSS has been determined for seven cultivars, namely Queen of the Vineyard, Waltham Cross, Alphonse Lavallée, Barlinka, New Cross, Almeria and Red Emperor. Results have shown that TSS value is a much better indication of maturity than the sugar/acid ratio. Grapes of the above-mentioned cultivars had developed a reasonable taste and appearance at a TSS value of 15%. With an increase in TSS value both taste and appearance improve. Attention is being given to the possibility of substituting the TSS for the sugar/acid ratio.

SUMMER RAINFALL AREA

A number of farmers in the Warm Baths, Vaalwater and Nylstroom areas intend to plant table grapes.

Cultivars such as Queen of the Vineyard and Alphonse Lavallée produce good crops of high quality grapes in these areas. Unfortunately these two cultivars are inclined to crack after unseasonable rain. Since the normal rainy season for the summer rainfall area is from October to March, there is a risk that farmers may sometimes

be unable to market their Queen of the Vineyard or Alphonse Lavallée owing to cracking.

Piobella, a cultivar bred by the Department, has proved to be very resistant to cracking. Although the berries are not as big as those of Queen of the Vineyard or Alphonse Lavallée, this grape sells as well as any other variety. Piobella is expected to be planted on an increasing scale in future. A farmer in the Kimberley area marketed 18 000 trays of Piobella during the past season.

A shortage of planting material, particularly grafted vines, remained a big major problem for the industry in the summer rainfall area.

It would appear that Dan-ben-Hannah and Italia also have a high resistance to berry cracking, so these two cultivars could also be planted in the summer rainfall area in future. During the past two wet seasons Dan-ben-Hannah has shown that its berries do not readily crack. During the past season Italia was not subject to cracking either. These cultivars, which ripen in succession, could possibly replace A. Lavallée in due course.

BREEDING

Three grape selections, viz BAR/Q 69-699, AL/BAR 58 and AL/BAR 69, appeared very promising. All the selections come from crossings in which one of the parents was Barlinka.

The selection BAR/Q 69-6999 is an early Barlinka type which ripens early in January. The grape is very similar to Barlinka, has a high resistance to cracking, colours better than Barlinka and has a good keeping quality. The berries are slightly bigger (6,7 g) than those of Barlinka (6,3 g).

The selection AL/BAR 69 is another Barlinka type which ripens about three weeks before Barlinka. The berries are a deep black, like those of Alphonse Lavallée, and are very firm and crisp, with the same good attachment as Barlinka. The bunches are not as dense as those of Barlinka. The berries are bigger (7,5 g) than Barlinka (6,3 g), with a good keeping quality.

The selection AL/BAR 58 is a Barlinka type. The berries are as black as those of Alphonse Lavallée, with an attractive bloom. They are very firm and crisp-even harder than AL/BAR 69. The attachment appears to be stronger than that of Barlinka. The berries are slightly larger (7,3 g) than Barlinka berries (6,3 g). Selection AL/BAR 58 ripens about two weeks before Barlinka.

Because most seedlings derived from the Barlinka crossings inherit the favourable characteristics of resistance to cracking, good keeping quality and tolerance of transportation, Barlinka is used in the breeding programme on a fairly large scale. During the past season twelve grape cultivars and sixteen selections were used as parents in 78 combinations. In all 15 000 seeds were planted.

DISEASES

The rainfall was again abundant during the past season. Downy mildew *Plasmopara viticola* therefore occurred in most viticultural areas. The infection was not, however, as severe as last season. The disease again destroyed a large number of young grape seedlings.

In Pretoria a new type of leaf spot, caused by *Isariopsis fuckelii*, was observed on grapes. The disease has been known in the winter rainfall area for a long time.

WINE GRAPES

The 1975 wine crop was 5 896 336 hl, which is 17 per cent higher than the previous year. The crop consisted of 50 per cent good wine and 50 per cent distilling wine. The total value of the wine crop at the producer level has now reached the R87 million mark.

Notwithstanding the high monetary value of the crop and the fact that the yield was so much higher than the previous year, a general decrease in the growth rate in the wine industry was discernible. An average growth rate of 4,0 per cent in total production has apparently been maintained since the early sixties. However, the growth rate for the seventies was only 2,4 per cent per annum, as against a rate of 5,1 per cent during the sixties.

The new plantings established under the provisional production quota allocation should,

however, make a considerable contribution to total production next year.

Apart from the effect of market trends, which naturally reflect the present economic situation, a shortage of disease-free and adapted vine propagating material, the problems that accompany the utilisation of marginal soils and the diseases and pests to which vines are subject are important contributory factors to the levelling off of the growth rate in the industry.

A number of positive steps were taken in 1975/76 to help solve the problem of obtaining improved and disease-free planting material. Firstly the Plant Improvement Act (Act 53 of 1976) was placed on the statute-book and secondly the draft regulations governing the provision of super grade vine propagating material have reached an advanced stage.

The sizable crop increases that can be brought about by the correct combinations of irrigating, trellising and pruning techniques have great economic implications for the industry and are the subject of further research at present. In the course of this research the mechanisation of the harvesting process, with specific reference to partial mechanisation and the effect of mechanical harvesting on the quality of wine, is being investigated.

The good progress made in the past with the demarcation of homogeneous viticultural areas was continued during the year under review. In terms of Act 25 of 1975 there are 15 larger districts, 6 smaller areas and 42 estates registered at present for the production of wines of origin.

EVALUATION OF CULTIVARS - FIRST PHASE EVALUATION

Imported scion cultivars

Only six cultivars were imported during the past year but 20 were released from quarantine by the Plant Protection Research Institute and handed over to the Oenological and Viticultural Research Institute for evaluation. 177 cultivars and clones have been imported so far, 150 of which have already been established on the OVRI's experimental plots.

Experimental wines were made from 48 cultivars this year. The following cultivars yielded superior wines:

Fernao Pires, Morio-Muscat, Nemes Furmint, Harslevelü (pecs 41), Xarello cataluna and Weisser Riesling 239. The following cultivars yielded quality wines: Mausenc blanc, Räuschling, Grecanico, Rombola, Elbling, Malvasia (ex Rioja), Calagrano, Calego farcado, Bourboulenc, Rabaner (Gm 22/73), Chenin blanc, Grenache blanc, Rousanne blanc, Pinot gris, Rieslaner, Aramon blanc, Viura and Vital.

Imported rootstocks

Only one cultivar was imported, which brings the total number imported (*Vitis* spp. included) to

60. Six cultivars and clones from quarantine were handed over to the OVRI for evaluation so that 54 of the imported cultivars and clones are now established on the OVRI's plots. Nine new cultivars have already been planted with four local crossings, with Richter 99 and Richter 110 as controls, in combination with six scion cultivars in an affinity screening trial.

SECOND PHASE EVALUATION

Scion cultivars in field trials

Of the 12 white wine cultivars from which experimental wines were made at Nietvoorbij, Bukettraube, Gewürztraminer, Chardonnay, Steen and Kerner produced superior wines, and the others all produced quality wines. Bukettraube produced the exceptionally high yield of 26 tons per ha on a Perold system.

Experimental wines were made from 17 white wine cultivars at Robertson. White Muscadell, Colombard and Kerner produced superior wines, and quality wines were obtained from seven cultivars. Yields were particularly high and 15 cultivars produced over 20 tons per ha on an extended Perold system.

Of the nine red wine cultivars from which experimental wines were made at Nietvoorbij, Cabernet-Sauvignon, Merlot, Sämling 3130, Heroldrebe, Cabernet franc and Tinta das Baroccas yielded superior wines. The other three produced quality wines. In the irrigated areas of the Olifants River and the Little Karoo Pinotage and Tinta das

Baroccas, and to a lesser extent Cabernet-Sauvignon, produced promising quality wines.

Heat treatment of cultivars

A further 21 scion cultivars and one rootstock were handed over to the Plant Protection Research Institute (Stellenbosch) for heat therapy. There are now 97 scion and 39 rootstock cultivars and clones undergoing virus purification. Ten scion cultivars (12 clones) and two rootstocks which are in the final phase of indexing have already been returned by the PPRI for ampelographic evaluation at Nietvoorbij.

NURSERY PRACTICES AND ESTABLISHMENT OF VINES

The testing of effective grafting techniques

A wide range of grafting and nursery practices, all with direct practical implications, was tested. Cold storage of grafting material at 1 to 4 °C undoubtedly has many advantages over sand storage and storage at higher temperatures. Very promising results have been obtained with callusing and it is already possible to ensure practically a 100 per cent take in the callusing box. Further research will be planned chiefly on nursery practices.

The major effect the screening of grafting material had on the percentage take (percentage

Trellised wine-grapes at Vaalharts



take trebled) indicates that care of the parent plantations is of the utmost importance if the highest percentage of good grafting material is to be obtained. With the correct grafting techniques and nursery practices it is possible to obtain a far higher percentage take and a better quality of grafted vines than are found in the industry at present.

Establishing vines

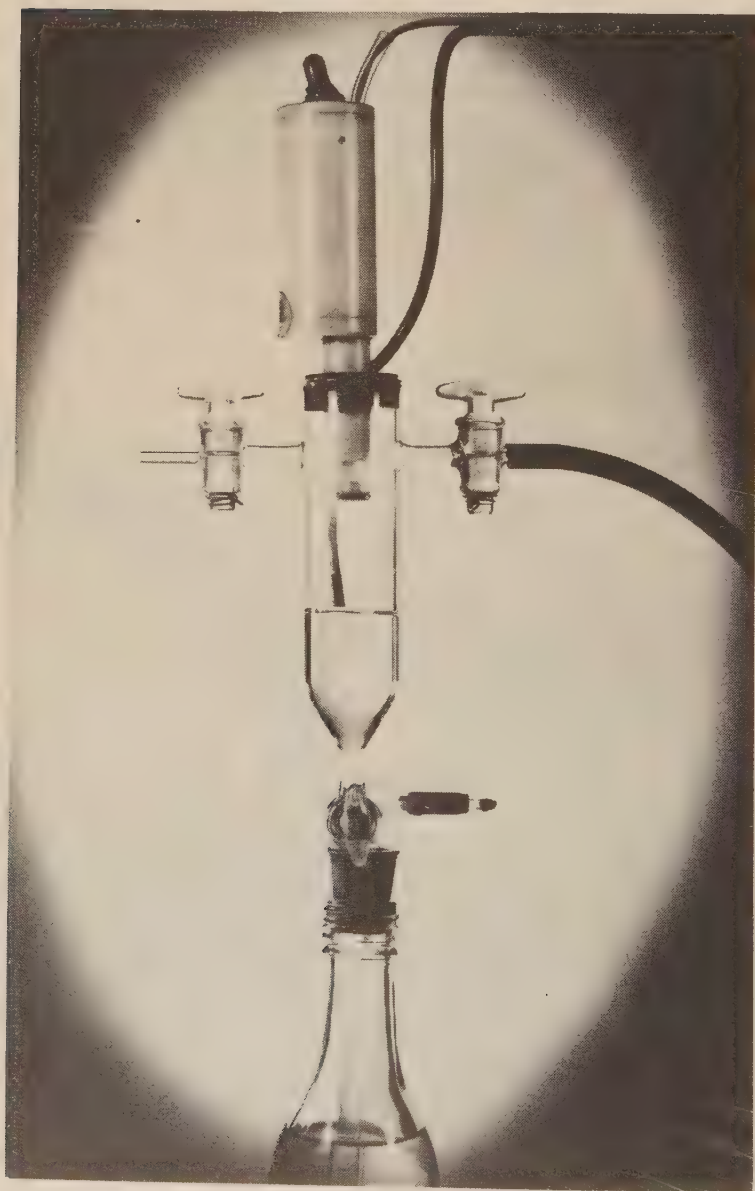
Research on the establishment of vines under conditions of limited irrigation or no irrigation water is of great importance to the industry, since about 50 per cent of South African vines are grown in these conditions. The gappy vineyards that develop as a result of poor establishment are typical of the Boland and are partly responsible for the low average yield per hectare.

Observations on vines for which a plastic soil cover was used during establishment were

continued, and it was demonstrated that the vines still maintained their advantage after three seasons, although the plastic had weathered away during the second growing season.

Although plastic covered with soil did not produce better results during the first two growing seasons than uncovered plastic, the covered plastic lasted very well and controlled weeds very effectively. Because the banks did not have to be weeded, a great deal of labour was saved. Although the vines established under plastic do much better than the clean-cultivated vines and also bear much better, the economics of using plastic will have to be studied over a number of years to determine whether the high establishment costs are justified in the long term.

The method of using small pieces of plastic in basins with a limited amount of supplementary water during establishment appears very promising. Not only does it reduce the cost of plastic per ha, but the growth vigour of the young vines is double



The oxygen electrode used to determine the dissolved oxygen content of wine

that of vines established by the usual method, where plastic is laid along the entire length of the planting row under dryland conditions and the vines are planted without any watering.

CULTURAL ASPECTS

Soil cultivation

For the third successive season retarded fermentation was observed in wine from vineyards where weeds were controlled with a bush slasher only. Although it is not possible to carry out comparative organoleptic judging, the very fact that retarded fermentation occurred indicates that cultural practices can affect vinification and consequently wine quality.

Soil cultivation studies at Robertson again showed that the cost of applying organic material in irrigated vineyards on these Shortlands soils is not justified. Under present cultural conditions it does not pay to trench the soil deeper than 750 mm either. Where water is more limited deeper trenching can be profitable on some soils, because the roots are then able to utilise a larger soil volume and consequently an increased moisture reserve.

Similar work at Nietvoorbij on Hutton soil also showed few positive results after the application of organic material. Although soil preparation by the trenching method gave better results than shallow ploughing, trenching at depths of over 750 mm appeared to hold no additional advantages under the conditions of the trial.

Irrigation studies

The first phase investigation into the effect of irrigation on the production and quality of wine grapes was completed at Stellenbosch. The findings of the present season, during which correctly scheduled irrigation with less than 300 mm of water produced a 50 per cent bigger crop than the unirrigated control, confirm similar findings of the previous year, when a crop increase of 40 per cent was obtained.

Effect of soil type

Although no conclusive evidence could be obtained during the past two seasons, it was clear that soil type has an important effect on wine grapes, in respect of not only production and growth vigour but also wine quality. Wine quality was not necessarily inversely proportional to production, as is popularly assumed.

The investigation into the reasons for quality differences is being continued by means of soil and moisture studies.

Research with regard to the influence of soil on wine quality is considered to be of cardinal importance since South African areas of origin for wine production are demarcated primarily on the basis of soil and climate, and there are no scientific guidelines with regard to soil at present. The fact that soil can have an important influence on quality is considered sufficient reason for demarcating

viticultural areas on the basis of the predominant soil type at this stage.

Fertilising

After two seasons of differential fertilising in a fertilising trial at Nietvoorbij it was observed that the treatments were starting to affect the concentration of some elements in the leaves, but no effect on growth vigour and production was observed.

Similar work on the more fertile soils of Lutzville has shown no response with regard to either vine performance or leaf analyses after the third season of differential fertilising.

GROWTH ARRESTMENT DISEASE

Encouraging results have been obtained with potassium in so far that the application of potassium has been reflected in the plant analyses. Whether this type of treatment can defeat the disease in the long term still has to be established. On the other hand, results of a second project indicate that the concentrations of inorganic elements have little connection with growth arrestment disease. It would be better to concentrate on organic analyses. Indications have already been obtained that there is a disturbance of the starch and sugar metabolism of diseased vines.

DISEASE CONTROL

The resistance of vines to

Phytophthora cinnamomi

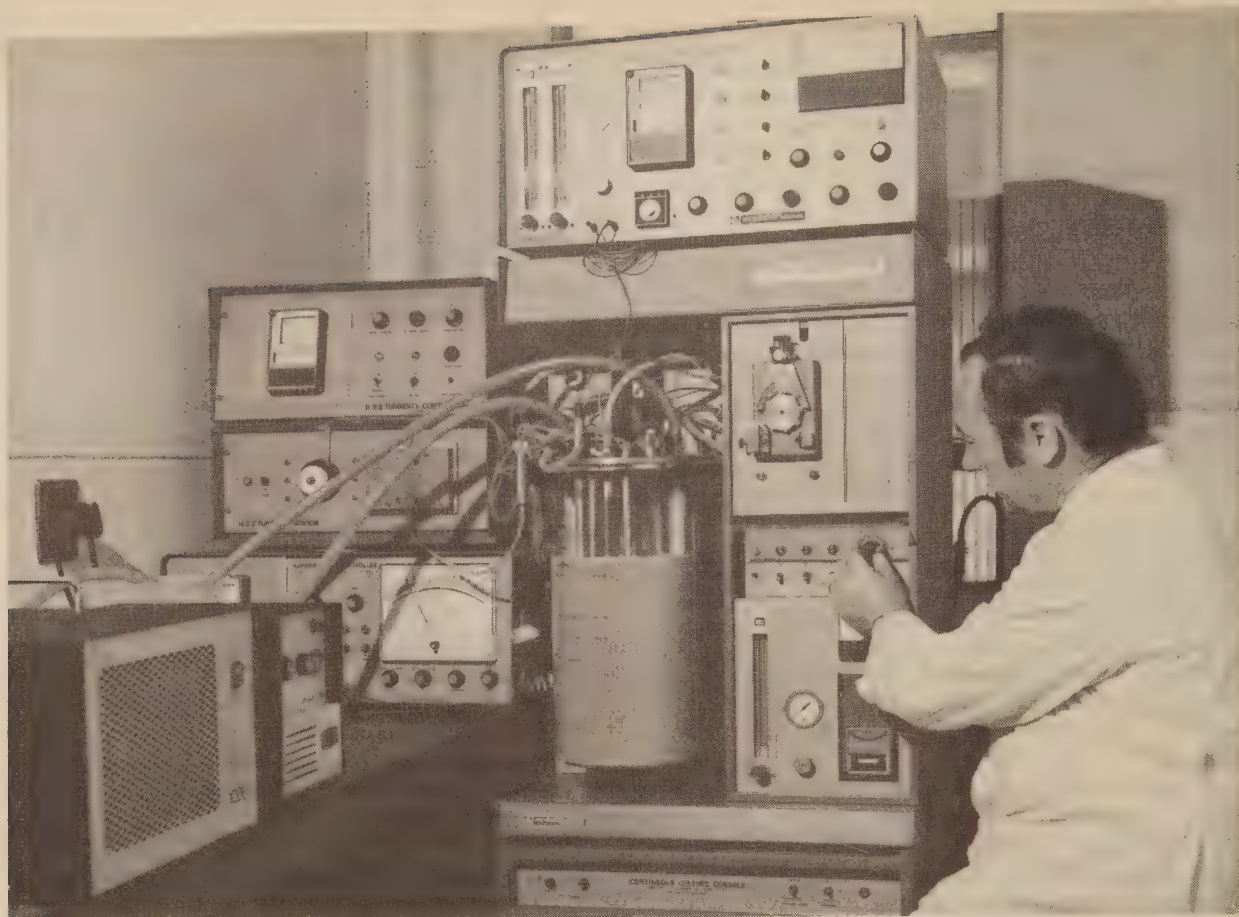
The resistance of vine rootstocks to *P. cinnamomi* was evaluated in water culture and a soil medium. Findings indicate that ungrafted *Vitis vinifera* vines have good resistance to this fungus. Rootstocks with *Vitis vinifera* as one parent (Jacquez, de Waal 1432 B and 333) apparently retain the *vinifera* resistance. On the other hand rootstock crossings from *Vitis rupestris*, such as Richter 99, *Rupestris* du Lot, 101-14 and Metallica, appear to be very susceptible.

Growth of *P. cinnamomi* on extracts of vine roots

Extracts from the roots of Alicante Bouschet, Jacquez and Richter 99 were prepared and incorporated in agar medium in various concentrations. The growth of *P. cinnamomi* on these media was investigated.

The growth rate, measured by the colony size after 14 days, shows that *P. cinnamomi* grew three times as fast on the control and Richter 99 media than on the Alicante Bouschet and Jacquez media.

These results indicate the presence of a substance or substances in the extracts made from Jacquez and Alicante Bouschet that suppress the growth of *P. cinnamomi* and probably help to make these vines more resistant to the disease.



Wine is prepared in a micro-fermenter under strictly controlled conditions to determine the influence of the fermenting temperatures and yeast races on the wine quality

Efficacy of fungicides against *Phytophthora cinnamomi*

The results obtained with chemical preparations such as Previcur, CGA 29212 and Difolatan have been very disappointing so far. However, hot water treatment of infected annual vines for 30 minutes at 50 °C provided complete control on *P. cinnamomi*.

These data are of great importance to wine farmers who buy grafted vines, especially if one takes into account the fact that surveys in nurseries in the Wellington district, where 50 per cent of grafted vines for the Western Cape are grown, revealed that in 1974 57 per cent and in 1975 20 per cent of the nurseries were infected with *P. cinnamomi*.

PEST CONTROL

Nematodes

Three field trials, in which the response of established sultana vines to treatment with nematocides was investigated, were concluded after 5 years. The results varied. Nematicur granules mixed with the soil in doses of 5 and 15 kg of active ingredient per ha neither controlled the nematodes nor improved the crop or the growth of the plants.

In two of the trials good control of certain nematodes, particularly *Tylenchulus semipenetrans*,

was obtained for up to 3,5 years by applying DBCP as an emulsifiable concentrate at a dose of 69 kg of active ingredient per ha. This resulted in improved growth and bearing, although the improvement in the crop was only statistically significant in the second season after the treatment. Despite the drop in the number of nematodes, the severity of the symptoms of growth arrestment disease was not affected. This is evidence that these organisms are not responsible for the disease.

Where granulated formulations of DBCP, Nematicur and oxamyl were applied to established Hermitage and Jacquez, DBCP in the form of an emulsifiable concentrate provided the best control of nematodes. This was the only treatment that improved the growth of the plants within two years.

Phylloxera

Rootstock resistance

During the winter of 1974 the Olifants River overflowed its banks and the rootstock trial at Vredendal was under water for six successive weeks. During February 1975 no phylloxera individuals were found on plots which had been 100 per cent infested the previous season. In January 1976, however, these plots were lightly infested again (33 per cent). Crop and shoot masses in 1975 and 1976 again showed that the flooding

had no adverse effect on the bearing and growth vigour of the vines.

Chemical control

In the Stellenbosch area it was found that hexachlorobutadiene at a dose of 250 kg per ha produced 100 per cent control of phylloxera for four successive seasons. In the fifth season after the treatment there was still 83 per cent control. A dose of 150 kg per ha gave good control for four successive seasons but after that the population started increasing rapidly. A dose of 75 kg per ha was totally ineffective.

The growth vigour and bearing of ungrafted cultivars are being compared with those of grafted cultivars in a trial at Nietvoorbij. The effect of phylloxera on the ungrafted vines was counteracted by treating these plots with hexachlorobutadiene at a dose of 150 kg per ha. Two years after planting all vines were still free of phylloxera and ungrafted Steen compared favourably with Steen and Colombard grafted on Richter 99. Ungrafted Colombard did very badly, however. The possibility that a harmful virus is present in these vines will be investigated next season.

Margarodes

Margarodes prieskaensis and *M. capensis* are known to occur on vines. Another species, *M. greeni*, has now been found on vines in the Worcester area and on apple trees near Piketberg. The growth vigour and crop of vines is impaired by this species and apple trees are killed off entirely.

M. greeni has also been found on kikuyu at Groot Drakenstein, where it causes lawns to die in patches.

Laboratory observations of *M. capensis* have been continued and it would appear that around 25 °C is the optimum temperature for egg production. No eggs are produced at 10 °C and 40 °C. Relative humidities of 75,5 and 32,5 per cent had no adverse effect on oviposition. The moisture content of a soil (field capacity 20 per cent) was varied from 2 to 30 per cent, but oviposition continued to take place.

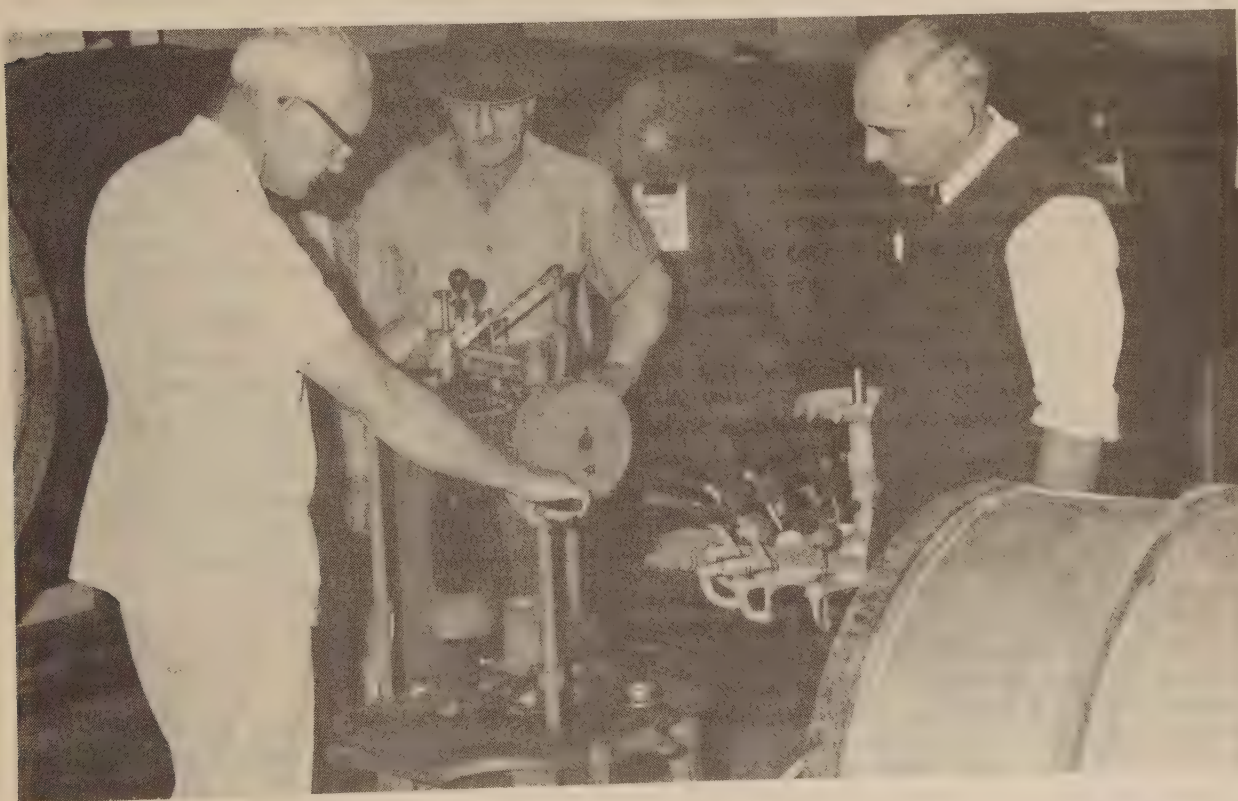
A temperature of 25 °C was beneficial for the hatching of eggs, but incubation did not take place at 10 °C, 31 °C and 40 °C. The effect of soil moisture on incubation was tested in a soil with a field capacity and saturation point of 20 per cent and 32 per cent respectively. It was found that the number of eggs that hatched increased as the moisture content rose from 2 per cent to 35 per cent. The incubation period lasted from 35 to 49 days.

In a dryland vineyard oviposition and incubation continue normally in summer, and irrigation boosts population growth.

WINERY TECHNOLOGY

Potassium sorbate as a wine preservative

As a follow-up to previous experimental work, the resistance of more wine yeasts to potassium sorbate was tested. The wine yeast *Saccharomyces bayanus* appears to offer most resistance (about twice that of *S. cerevisiae*). This



This year champagne was bottled at Elsenburg for the first time. Adjustments are here made to the bottle-corking machine

means that in practice less than the effective concentration (268 mg of sorbate/dm³) should in no circumstances be used for wine preservation.

The verdict of a panel of judges on a sorbate-treated semi-sweet white wine shows that the judges were unable to detect 268 mg of sorbate/dm³. This strongly indicates that the public will not be able to detect this preservative if it is correctly used.

Bacteria are able to metabolise sorbate and produce an unpleasant flavour in wine, the so-called geranium flavour. Observations were carried out in 1976 on three tanks of sweet reserve which had been preserved with 335 mg of sorbate/dm³ and about 50 to 70 mg of sulphur dioxide/dm³. Visible bacterial growth had developed in one tank after a few months and the sorbate concentration had dropped to 241 mg/dm³. No geranium flavour could be detected at that stage, but a distinct geranium flavour developed when wine was added. Further experimental work with white and red wine is necessary, but it is clear from the above results as well as from overseas studies that potassium sorbate can under no circumstances be used in industry for preserving must.

Reduction of the sulphur dioxide in wine

This investigation is being approached from a microbiological and technological point of view. The microbiological work entails a search for a wine yeast which maintains a high fermentation rate at low fermentation temperatures and produces a good alcohol yield and a low yield of sulphur dioxide fixing and oxidizable by-products. Sixty yeasts from 10 species were evaluated during the past year. It was possible to isolate 15 promising yeasts. These yeasts are undergoing further evaluation.

An investigation into the effect of technology on the sulphur dioxide requirements of wine revealed that it is not only the pasteurisation of must that suppresses the catalytic action of enzymes in the oxidation process - low temperatures (around freezing point) have the same effect. This finding is not recorded in any of the literature and it opens up interesting new possibilities for research on the part played by sulphur dioxide (SO₂).

It has also been found that cultivars differ radically in the rate at which oxygen combines with the must components. It would therefore be possible to adjust the addition of SO₂ according to the cultivar instead of simply following a fixed recipe. The SO₂ in the wines of some cultivars could be reduced considerably without modifying the present technology or changing the yeast strain.

A special cell in which the combination rate of oxygen with must and wine components can be measured and which can be repeatedly filled and emptied without any atmospheric oxygen contaminating the samples has been designed, built and tested. The cell functions very well and makes the study of oxygen uptake considerably easier.

Evaluation of dried wine yeast for wine-making

Extensive laboratory and winery trials with dried wine yeast have been undertaken to determine whether it is acceptable and what effect it has on wine quality. The preparations include the following yeast types: *S. cerevisiae* (strains Epernay, Montrachet and 228), *S. bayanus* (strain Champagne), *S. beticus* and a mixture of wine yeasts dried together.

The most important conclusions that can be drawn from the results of the winery trials at this stage are the following:

- (a) Wines made from various cultivars with various dried yeast types could not really be distinguished from the conventionally made controls by organoleptic means. These experiments are still in progress, however.
- (b) There are major differences in the fermentation rate of various dried yeasts at low fermentation temperatures.
- (c) The fermentation period (in comparison with conventional selected yeast) is not necessarily reduced when dried yeast is used; the specific yeast type determines this factor. The same applies when a bulk inoculum (2 g of yeast/dm³) is added.

Laboratory experiments largely confirm the results of the winery trials and show that the yeast type (viz the strain or species) is the chief factor in determining the yeast's technological properties. In view of the advantages of dried wine yeast for wine-makers, this development is undoubtedly a windfall for the industry.

Stricter control will have to be exercised over the number of types of wine yeast at present available to wine-makers.

Microbiological services

During the 1976 season selected yeast was supplied to only 19 wineries and other bodies. This is 50 per cent less than the figure for 1975. Clearly an increasing number of wineries prefer to use commercial dried wine yeast rather than prepare selected yeast themselves.

From July 1975 to July 1976 111 wines were received from outside institutions for microbiological analysis, both for diagnostic purposes and for quality control. These wines represent samples for membrane filter analysis and/or paper chromatographic tests. The number of samples reflects the concern felt by wine-makers about the preservation of white wines and the malo-lactic fermentation in red wines.

CHEMICAL ASPECTS

Specific aroma substances

In studies on wine aroma substances which are often present in low concentrations - such as certain esters, the determination of the components is often hampered or made impossible by the interference of alcohols. The pre-separation of esters and alcohols was therefore investigated. A

method was developed whereby the alcohols can be separated from the esters on a silica gel column with the aid of Freon II at very low temperatures. Successful separations have been made in this way.

Factors affecting the formation of the ester ethyl decanoate in wine are being investigated, since there are indications that this ester is an indicator of quality. It has been established that a long fermentation and small quantities of atmospheric oxygen during fermentation suppress the formation of this ester.

It has also been shown that the grape sugar concentration is not correlated with the drop in the ethyl decanoate concentration. It is therefore clear that the condition of the grapes on arrival at the winery and conditions during fermentation have a major effect on the formation of quality components.

Relation between esters and wine quality

Wines were made from Steen and Colombard grapes harvested at various stages of ripeness. Contrary to the practice followed in former years, the musts were not deacidified. The wines were analysed for 8 esters and the individual ester concentrations were correlated with the results of organoleptic judging. A significant correlation was found between the marks awarded after organoleptic judging and the concentrations of ethyl octoate, isoamyl acetate, hexyl acetate, ethylhexoate and β -phenylethyl acetate, provided the wine left a pure impression on the nose and palate. The same correlations could not be found between show wines from various areas and their ester concentrations, but it was established that the ester concentrations of wines either increase or remain constant or decrease over a period. The investigation is continuing.

The effect of phenols on wine quality

This project entailed a great deal of development work on methods, since the field is a relatively new one. Considerable success was achieved and reliable means of automated analysis for analysing the various phenolic or colour-linked groups of compounds in wines were developed, adapted and tested.

The methods were then used to analyse the relation between the concentration of various groups of compounds and the quality of various wines. Highly significant correlations between various readings and wine quality were found. The problem is, however, that many of the parameters measured are inter-correlated as well, so that their correlation with quality may be induced as a result of their relation to colour. This aspect requires further investigation.

LIQUOR CONTROL

Wine certification scheme under act 25/1957

The following table shows the quantity of the

various types of wine certified for sale by the Wine and Spirits Board during the year under review, with indications of origin, grape cultivar and/or vintage.

Certification of wines of origin and cultivar and vintage wines

Type of wine	Superior quality		Ordinary standard		Total certified hℓ
	hℓ	%	hℓ	%	
Unfortified wines	7 618	6,7	106 608	93,3	114 226
Liqueur wines and other fortified wines	-	-	70 422	100	70 422

Liqueur wines of origin (70 422 hℓ) were certified for the first time during the year under review. These wines consisted chiefly of stocks of matured fortified wines of the KWV intended for export.

The total of 114 226 hl of unfortified or natural wine certified this year represents 3,8 per cent of the 1975 good wine crop and 6,0 per cent of the total local consumption of wines in this category during the 1975 calendar year. It is interesting to note that the corresponding quantity certified during the previous year was 105 846 hl, which represented 4,1 per cent and 5,4 per cent of the 1974 crop and local consumption respectively. This indicates that since the introduction of the certification system the volume of natural wines certified, expressed as a percentage of production and local consumption, has remained virtually constant.

Inspection of wine spirits and rebate brandy

The work of the Government Brandy Board with regard to the inspection of products of the vine for quality is reflected in the following table.

Certification of rebate wine, rebate brandy and wine spirits

Type of wine or spirits	Total inspected		Approved hℓ	% Rejected, by volume
	Samples	hℓ		
Rebate wine	2 469	945 732	908 382	3,95
Rebate brandy	618	173 981	169 705	2,48
Wine spirits	739	276 344	271 641	1,7
Low-strength spirits	113	25 266	23 841	5,64
Spirits for vinegar production	4	2 386	2 386	None

What strikes one immediately about the above table is that the volume of rebate wine approved (908 382 hℓ) was large again this year. The corresponding figure for the previous season - over 1 million hectolitres - was a record. This shows that the industry has taken particular care over the past two seasons to build up the stocks of rebate brandy, which stood at a critically low level two years ago.

A further characteristic is the relatively low rejection figures for rebate wines, viz 1,5 per cent and 3,9 per cent respectively, during the past two seasons, in comparison with rejections of up to 22 per cent during the years preceding 1974. This may be ascribed to the fact that since 1974 distillers have applied strict pre-selection before submitting wines to the Board for official inspection.

Inspection of liquor sales premises and manufacturing premises

Two liquor inspectors appointed under Act 25/1957 travelled 87 483 km during the year under review and paid 1 916 visits to sales premises in the Republic, where 82 202 samples of liquor were inspected or subjected to preliminary testing. Eighty-six samples were sent to the Institute for further chemical analysis and 82 on account of incorrect labelling.

These investigations gave rise to 15 court cases, one of which was later withdrawn; one of the persons charged was acquitted and in three cases the licensees were convicted and fined. Admissions of guilt were accepted by the Public Prosecutors in seven cases, and three cases are still pending. Twenty-two licensees were cautioned for less serious offences.

Quality control of export liquor

In all, 2 011 samples, representative of 140 886 hl of wine and spirits, were examined by the Wine and Spirits Board in terms of the Liquor Export Regulations. 1 962 samples (97,5 per cent), representative of 140 733 hl (99,9 per cent), were certified as suitable for export on the basis of quality and chemical composition. This represents a reduction of 8,4 per cent on total exports during the previous year.

Control of imported liquor

In all, 1 686 samples of imported liquor were examined. 1 289 were subjected to comprehensive chemical analysis, and the remaining 397 were inspected for labelling only. Certificates of removal were issued in respect of 1 071 samples.

Routine analytical services

The routine analytical laboratory of the Control Section of the OVRI analysed 8 812 liquor samples during the year under review. This figure includes both analyses carried out as part of the control services in terms of Act 25 of 1957 and analyses in terms of other Acts.

New legislation

The Wine, Other Fermented Beverages and Spirits Amendment Act, 1976 (Act 68 of 1976), provides, in the main, for the more efficient application of the wine certification system, including certain provisions regarding the demarcation of estates, clearer descriptions on labels, regulations governing the more effective

control of imported liquor and the levying of inspection fees.



The wax excretion of a female citrus red scale. The strings of wax eventually form the hull layer. (Enlarged 4 000 times)

CITRUS

Breeding for resistance to black spot - A chemical substance was isolated from the peel of fruit with black spot symptoms. This substance does not occur in normal fruit. In collaboration with the CSIR the compound was identified as 6,7 dimethoxy cumarin (scoparone).

The occurrence of this substance in gamma-irradiated grapefruit had already been reported by an Israeli researcher. Of special interest is the fact that scoparone does have a fungistatic activity. However, neither Bitter Seville nor its resistant crossing contains scoparone. It therefore appears that contrary to initial expectations this substance is not directly involved in the resistance of certain cultivars to black spot.

It was observed that black spot symptoms do not occur on the fruit of acid limes, but do occur on sweet limes. A large number of lime crossings were therefore made.

Breeding for tolerance to greening - During the previous season a visit was paid to a farm in the Northern Transvaal where acid limes are cultivated on a commercial scale. In the past sweet oranges were the main crop cultivated on this farm, but greening affected these trees so badly that they were top worked into acid limes. This type of citrus was chosen because of the healthy condition of acid limes in a domestic garden in the vicinity, in spite of severe infection of other types of citrus in that area.

These top worked trees have a healthy appearance and there are no signs of the sporadic, yellowish branches and the uneven yellowing of leaves and asymmetric fruit which characterise greening-infected orchards.

During the spring of 1975 roughly 2 600 lime crossings were made. These include a number of sweet lime crossings. As soon as seedlings are obtained, their tolerance to greening will be determined.

Nucellar embryony - Nucellar embryony is a great obstacle to breeding since the crossings are difficult to identify and usually have to be planted out together with large numbers of nucellar seedlings.

During the present season it was found that the sexual and nucellar embryos can already be distinguished in the seeds of certain crossings, this being done on the basis of cotyledon colour.

CITRUS IMPROVEMENT SCHEME

During the past two years this scheme has got into stride properly. There are now 22 participants in the scheme, 13 nurseries which cultivate certified trees, 67 candidate trees and 308 potential candidate trees.

Thus far 285 000 buds have been cut from registered trees under the supervision of authorised witnesses. During 1976, 155 000 trees will qualify to be sold under the rules of the scheme.

The indexing programme for exocortis for the first season has just been completed. A total of 283 trees were indexed, 68 of which were positive cases of exocortis infection.

CHEMICAL WEEDKILLERS

Bromacil, diuron and Paraquat, which are registered for use in citrus orchards, are recommended.

Bromacil is recommended where quickgrass occurs and diuron where there is no quickgrass. Diuron is much cheaper and does the same work as bromacil, except on quickgrass, which it does not control. Paraquat, which is a contact preparation, can be used alone, in which case it should be sprayed every four to six weeks. By spraying this often most weeds, even nutgrass, are controlled. Paraquat can be used in combinations with bromacil or diuron.

Sterilisation preparations have been applied successfully through microjets, and this procedure is recommended. Application can take place during irrigation.

Glyphosate, which has been tested for the past four years, appears very promising when an application is followed by diuron after four to six weeks. This combination controls all weeds. Buffalo grass, which is not controlled by bromacil or diuron, is controlled by Glyphosate. This preparation is expensive, but treatment resulted in an exceptionally large crop this season, thus justifying the cost.

It appears that the N content of the leaves is high where diuron and/or Glyphosate are used. This may mean that less nitrogen per tree will be necessary later.

When the higher production per tree is seen in terms of money, there can be no doubt that the cost of weedkillers is more than justified.

CROP FORECAST FOR NAVELS AT CITRUSDAL

An investigation involving 11 seasons' climatic data showed that maximum temperatures during September, October and November are the most important factor which determines the size of the navel crop in the Citrusdal Valley. At least 75 per cent of the variation in crop size is due to the maximum daily temperatures during these three months.

A formula was proposed by which crop forecasts for this area can be made.



The occurrence of polyembryony, specifically nucellar embryony, in citrus. In this case the sexual seedlings have white seed-lobes, while the seed-lobes of the nucellar seedlings are greenish. (The sexual white embryo is indicated by a black dot in all cases)

POCK-MARKED PEEL AND OLEOCELLOSIS

The extent of these two peel defects has decreased considerably since the 1974 season. Precautions which apply chiefly to oleocellosis were brought to the attention of producers.

Since the external difference between pock-marked peel and oleocellosis symptoms is not always very clear, inspectors are advised to avoid referring to doubtful symptoms, which could be oleocellosis, as pock-marked peel. The reason for rejection is very important because it enables the producer to take precautions against oleocellosis damage.

PESTS AND DISEASES

Integrated control

While the majority of citrus growers in the Rustenburg area have again followed an integrated spray programme and discontinued annual sprays for red scale, growers in the Letaba and Letsitele areas have had to apply as many as five sprays in one season to control this pest because it has become resistant to organophosphate insecticides.

In other areas some of these insecticides have again caused repercussions from non-target pests. These problems emphasise the urgent necessity for integrated pest control programmes for each citrus

area. Research is now being directed at providing an integrated control spray programme to cope with resistant red scale.

The commercial acceptability of integrated pest control programmes based on the biological control of red scale is evident from the fact that this method is at present being applied to a total of one million trees in six citrus areas.

An integrated control programme for the Lowveld, which allows red scale (where it is not yet resistant) and mussel scale to remain under biological control, has been developed after four years of research work. The programme includes chemical control measures for thrips, rust mite and black spot.

Citrus thrips

Experiments conducted over three years have proved that triazophos (Hostathion) is a very satisfactory alternative to tartar emetic for the control of citrus thrips in an integrated programme which allows red scale to remain under biological control without causing serious repercussions of other pests.

Further research on the use of soil systemics such as dimethoate to control citrus thrips was again very promising and soil systemics will also be tested on red scale.

Another aspect under investigation is the use of plastic films sprayed onto the tree to protect small susceptible fruit from being blemished by thrips and by wind.

Bud mite

In a trial on navel trees where bud mite was controlled annually in the past, but where control was not done during the past two seasons, bud mite infestation increased to such an extent that the crop decreased to the equivalent of that from untreated trees. During previous years the crop from treated trees was always significantly better than that from untreated trees. It is therefore clear that bud mite on navels must be controlled annually in order to prevent losses.

A trial to determine the time for spraying in respect of fruit damage showed that the critical period is from January to March.

Certain of the chemical preparations which are used widely on citrus, such as benomyl, carbaryl, methidathion, temephos, methomyl and azinphos-methyl, have little or no effect on bud mite. Other preparations, such as tartar emetic plus sugar and dimethoate, have a mild suppressing effect. Triazophos, chinomethionat and dicofol gave satisfactory results, while chlorobenzilate and bromopropylate gave outstanding control.

Other mites

The predatory mite *Amblyseius citri* is an effective predator of citrus red mite in small numbers, as was found in unsprayed orchards and orchards in an integrated pest control programme.

The distribution of *A. citri* corresponds very closely to that of the prey (red mite) on the trees.

The fact that the predatory mite also eats other mites and vegetable matter enables it to survive even in the absence of the red mite and therefore to be present on the trees throughout the season. This predatory mite is therefore an effective predator of the red mite.

The predatory mite is adversely affected by the preparations normally used in citrus orchards in the Lowveld, however. Chlorobenzilate and bromopropylate appear to be fairly harmless to the predatory mite, however; mancozeb, on the other hand, is more harmful to the balance between the red mite and the predatory mite.

Various agricultural sprays can cause a build-up of red mite if applied to citrus. This phenomenon is caused either by the inhibition of the predators or by a physiological stimulus, or by a combination of both factors. With DDT, temephos, methomyl and methidathion increases in red mite were obtained in small-scale experiments. Apparently this cannot be ascribed to predator inhibition alone.

False codling moth

The most important fumigation experiments have been completed and the successful programme is summarised in an article entitled "Cold sterilization and fumigation for the control of false codling moth, *Cryptophlebia leucotreta*", to be published in *J. ent. Soc. S. Afr.*

From a practical point of view, sex traps for the false codling moth can only be used to gain a general impression of the seasonal occurrence of moths in an orchard. The biggest false codling moth catches in each three navel orchards were recorded during February. The greatest losses of fruit which dropped off the trees in unsprayed orchards were recorded during the period November to December. It is therefore very important that sanitation measures be applied early in the season.

Triazophos 40 E.C. (Hostathion) at 0,06% (0,025% a.i.), sprayed at 100% petal fall and again 5 weeks later gave outstanding control of false codling moth for a period of 2½ months, compared with the untreated control. This preparation is registered for thrips control and can therefore be used to advantage, particularly where integrated pest control is applied.

False codling moth, which appeared for the first time in 1974 on the farm Die Bad in the Citrusdal area, spread through the valley during the past season, causing considerable damage. Fruit losses are put at 12½ per cent or higher.

Citrus nematode

Important developments occurred in the field of nematode control during the past year. Firstly it was found that both phenamiphos (Nemacur) and triazophos (Hostathion) are effective for the control of citrus nematodes. Both these products can be applied in the irrigation water, and being

non-fumigants there is no loss of activity due to evaporation.

Furthermore, phenamiphos has also been tested through the microjet irrigation system, where it was found to be evenly distributed, giving 99% control of citrus nematode down to a depth of 450 mm. This can lead to a very significant saving in the labour required for orchard treatment.

Various filter systems have also been tested in order to find ways of removing nematodes from irrigation water, especially water for use in nurseries. A system that is almost 100 per cent effective and yet has a high speed of delivery is now available.

A survey of nurseries for lesion nematodes (*Pratylenchus*) fortunately showed no infestations of these harmful nematodes.

Greening

Although it has been shown conclusively that citrus greening is carried by the citrus psylla, there is much about the vector-pathogen relationship that has not yet been determined. Recent experiments have shown that psylla carrying the greening organism can infect healthy citrus after only half an hour of exposure.

Other tests are being conducted to determine the seasonal variation, if any, of transmission, the effect of insecticide on the ability of psylla to transmit the disease, the feeding time required for the psylla to acquire the organism, and the host-range of both the insect and the pathogen.

Research on the use of antibiotics and other chemicals for the control of greening is continuing and tetracycline has now been registered for injection into citrus trees for the control of greening disease.

SUBTROPICAL FRUIT

AVOCADOS

Producers are becoming increasingly aware of the importance of the Duke cultivar as rootstock in view of its greater resistance to *Phytophthora cinnamomi*. Applications for seed for 1976/77 have already exceeded the 7000 mark. The new rootstock cultivars Duke 6 and 7 will start producing during this period. The rootstock cultivar G22 is being planted and the introduction of G6 and Huntalis is under discussion.

In addition to the three commercial cultivars, Fuerte, Edranol and Hass, the new cultivars Ettinger, All Boyee, Bacon and Teague are also being planted.

The occurrence of abnormal graft unions, indicating a translocated type of graft-incompatibility, was investigated biochemically. Considerable differences were noted and further investigations are taking place.

Fertilising

Producers who have for some years been using leaf and soil analyses to determine the



Seedlings originating from embryos of Minneola seeds after cross-pollination with the trilobate *Poncirus trifoliata*. On the left are nucellar seedlings (monocotyledonous leaves) from embryos with greenish seed-lobes. On the right are sexual (trilobate leaves) from embryos with white seed-lobes

fertilising requirements of their orchards derive great benefit from this service. It is clear that despite lower applications, and hence a saving on fertilising costs, the appearance of the trees and production are greatly improved.

There are, however, still many orchards with a high nitrogen content, where nitrogen applications should be reduced. The regular application of lime does not receive the attention it deserves either. In as much as 75 per cent of the orchards the soil pH is low and the aluminium content rather high. Since good results have been obtained with zinc and boron sprayings, these micro-elements are now applied regularly in orchards where deficiencies occur.

Sunblotch disease

Present methods of indexing can take more than a year to give results and work is therefore being done to find quicker, reliable methods. These methods involve testing various avocado cultivars and other related plants to see whether any develop clear symptoms quickly, as well as biochemical studies to determine whether there are any clear differences between virus-free plants and healthy plants.

Phytophthora root rot

This remains the most important disease of avocados in South Africa and several methods of control are being attempted:

1. The production of disease-free nursery trees.
2. The use of resistant rootstocks.
3. The assay of various fungicides for their efficacy in curing infected trees.

The main stumbling blocks in this research are the high degree of *Phytophthora* inoculum carried in irrigation water, the difficulty of vegetatively reproducing avocados and the relative scarcity of effective soil fungicides.

Storage

As a result of efforts to place avocado exports on an increasingly organised basis there was a pressing need during the past season for an easy method of making avocado oil determinations.

This problem was solved by the discovery that the sum of the moisture and oil percentages of a particular cultivar remain constant, irrespective of variations in the oil percentage.

These constants were calculated for Fuerte, Edranol, Hass and Zutano avocados, and were 89,8, 90,9, 87,8 and 90,7 per cent, respectively. The oil percentage in the fruit can therefore be determined easily and accurately by simply doing moisture determinations on the type of fruit concerned and then subtracting the moisture percentage from the corresponding constant. This method is easy and quick, and no expensive and complicated apparatus is required for the determinations.

A new type of wax (code name P. 50) which can possibly increase the shelf life of Fuerte

avocados and at the same time serve as a substitute for the conventional cellophane wrap was tested during the past season. The replacement of this wrap by an easy-to-apply wax preparation will result in a big saving in manual labour.

The results showed that a suitable wax preparation can retard the ripening of avocados just as well as cellophane.

PINEAPPLES

The results obtained at East London from the potassium fertilising of Cayennes were confirmed by the results of a similar trial at Bathurst. Potassium applications on soils with a low K status are essential for the high production of good quality fruit.

The best results are obtained when all the potassium is applied to the soil before planting, as against regular sprayings. Potassium chloride gives the same results as potassium sulphate.

Herbicides

In the search for a suitable herbicide to control the grasses *Panicum* and *Paspalum* spp. good results have been obtained with pre-plant treatments of Velpar at 2 to 3 kg per ha. Velpar at higher concentrations or applied after planting was found to be phytotoxic to smooth Cayenne pineapples.

Chemical propagation

Chlorflurenol methylester (CF-125), when applied to pineapple plants just after flower differentiation, was found to induce the formation of vegetative fruitlets. These fruitlets, which were almost identical to normal slips, replaced the pineapple fruit.

In preliminary trials, chlorflurenol treatments resulted in plants producing up to 30 vegetative fruitlets in place of one normal fruit. The chlorflurenol-induced slips were planted out in the field and to date are growing normally.

Nematodes

Further work is being done on the evaluation of the nematicides oxamyl and phenamiphos. Although additional yield data is not yet to hand, nematode counts indicate that a combination of pre-plant fumigant treatment and post-plant foliar sprays is highly effective in reducing nematode populations.

The degree of nematode control obtained from spraying smooth Cayenne tops with oxamyl or phenamiphos shortly after planting, appears to be very similar to that obtained from dipping the tops in a solution of the nematicide before planting.

In a nematode survey of the pineapple producing areas of the Republic, 33 different nematode species were extracted from pineapple root samples. Of these species *Pratylenchus brachyurus*, which is very common in Zululand, and *Meloidogyne javanica* were considered the most important. This conclusion was supported by

the results of pathogenicity tests carried out in the glasshouse.

In an attempt to induce mutation in pineapple planting material and so create an eelworm-resistant plant, smooth Cayenne tops were exposed to gamma radiation at levels varying from 2 to 12,5 krad. Ten months after planting out in the field, all untreated control plants had grown well, but 4% to 8% of tops exposed to 3 to 7,5 krad had died. A mortality of over 50% was recorded from those tops exposed to 10 and 12,5 krad.

Lateral sucker growth was evident at the lower radiation levels, but from 10 krad upwards no lateral growth was noted.

In trials to evaluate various pastures for rotation with pineapples so as to suppress nematode populations *Chloris gayana* var. Katambora, *C. gayana* var. Pioneer and *Desmodium* spp. gave the best results.

Insects and mites

The establishment of a reliable sampling technique has enabled the assessment of field population densities and the study of the seasonal development of the leathery pocket mite *Steneotarsonemus ananas*. For *S. ananas* control the acaricides which appear to hold most promise are endosulfan, propargite, bromopropylate, dicofol and tricyclohexyltin hydroxides. These chemicals show varying degrees of residual toxicity, the longest acting being endosulfan.

Long-term control of mealybug was obtained by dipping the planting material into insecticide solutions. Solutions of the following insecticides have shown good mealybug control: Salithion, diazinon, methidathion, dimethoate and demeton-s-methyl.

The presence in pineapple lands of two different thrips vectors of yellow spot has been established. These vectors are *Thrips tabaci* and *Frankliniella schultzei*.

Various insecticides for the control of soil-inhabiting beetles and grubs have been tested. Isazophos was found to give very good control while carbofuran was almost as good as HHDN, the control measure currently recommended.

Fertilisation

Results have shown that the application of potassium as a pre-plant soil treatment too close to young developing plants can cause root damage and the retardation of plant growth, potassium chloride being far more phytotoxic in this respect than potassium sulphate.

A shortage of potassium in the plant crop can seriously affect sucker growth in the subsequent ratoon crop plants. Where no potassium was applied to the plant crop, the ratoon crop plants showed very poor growth, with few suckers. These suckers will produce small unmarketable fruit.

The application of iron to smooth Cayenne pineapples as iron sulphate or iron chelate is being investigated. Observations have shown that both forms of iron result in plants with improved leaf

colour and growth, compared with the untreated control plants.

BANANAS

Another Cavendish selection, the Americani, was imported from Réunion during 1976. Under conditions on Réunion this selection has the same characteristics as Williams, but it is a shorter plant and is thus less susceptible to wind damage.

Figures for the past eight years show that the average monthly foliation rate and the average period between flowering and harvesting for specific regions follow the same pattern every year.

The foliation rate of Williams is higher than that of Dwarf Cavendish and it therefore appears that Williams grows faster.

Fertilising

A fertilising trial over three crop seasons at Levubu shows clearly that excessive applications of N, P and K have a suppressive effect on production and also result in a higher percentage of low grade fruit. The necessity of judicious and balanced fertilising, which can only be achieved with the aid of leaf and soil analyses, has therefore been confirmed again.

Storage

During past seasons it was found that the solubility of thiabendazole, which is currently used for the control of post-harvest spoilage in bananas, can apparently be improved by lowering the pH of the fungicide solution. This finding was followed up during the past season by an investigation of the effectiveness of this fungicide treatment against collar-rot, after its pH had been reduced to various levels. No significant differences were found.

Collar-rot control was very good throughout, however, and the fruit showed no harmful or beneficial effects that could be attributed to the reduced pH.

The possibility of storing bananas for long periods was also investigated. This work was done mainly with a view to exporting bananas. The three different trials conducted thus far showed that 10 °C is the best storage or shipping temperature for this fruit. The fruit should preferably be ripened overseas after shipment in order to retain an acceptable taste.

Better control of collar-rot is necessary, however, and export fruit will have to be harvested and handled much more carefully in order to reduce the blemishes which become very prominent after a storage period of a few weeks.

These trials showed that a quite acceptable product can be delivered overseas six to seven weeks after harvesting.

Research on the hard cord problem indicated that this problem is partly related to prevailing temperatures. It was found, *inter alia*, that it is only during the hot summer months that the fruit does not soften normally during ripening. The data



A trial consignment of South African export bananas upon arrival overseas, 4 weeks after harvesting

obtained also revealed that the fruit is at its softest during July.

MANGOES

Large expansions are still taking place in the mango industry. It is estimated that there are at present about 500 000 producing trees and 300 000 young trees. By 1980 roughly 1 000 000 mango trees will be in production. The South African Mango Forum, an advisory body, finalised mango export and local marketing regulations in collaboration with the Citrus and Subtropical Fruit Research Institute and the Department of Agricultural Economics and Marketing.

Mango pruning experiments showed that the mango tree responds well to pruning and that income and production can be increased appreciably in this way. The mango selection programmes have already produced good results in the search for cultivars which will do better under South African conditions. Production capacity and quality tests will have to be conducted for several years before final recommendations concerning these promising selections can be made.

Mango weevil

It has been known for some time that the mango weevil *Sternonchetus mangiferae*, which hides in mango seeds, is not a problem on early maturing cultivars. But on some of the new, fibreless, late-maturing cultivars the weevil emerges from the seed into the flesh, where it ruins the fruit.

Experiments have been conducted with gamma irradiation in order to suppress the weevil inside the fruit. The fruit of early and late-maturing mango cultivars was irradiated at doses ranging from 30 to 85 krad. In the early-maturing cultivar more immature stages of the weevil were present and a high percentage mortality of weevils was achieved by irradiation. A dose of 50 krad prevented any emergence of weevils from the seed.

In a late-maturing cultivar most insects were already in the adult stage and mortalities were therefore generally lower. At doses lower than 50 krad, i.e. 30 and 37,5 krad, there was a marked drop in the efficacy of the treatment in preventing weevil emergence.

It is concluded that a radiation dose slightly in excess of 50 krad is the optimum treatment of mango fruit against mango weevil. In this dose range there are no significant harmful effects on fruit quality.

Diseases

Bacterial spot disease of the mango, caused by *Pseudomonas mangiferaeindicae*, remains the most troublesome disease of this crop.

In a spray trial conducted on Kent mango trees in the Northern Transvaal eight chemical spray treatments were applied, including two new organic bactericides. The best results were obtained in the plots which had been sprayed with copper oxychloride/benomyl or copper oxychloride/mancozeb or copper oxychloride/zineb mixtures. These

treatments reduced the amount of fruit infected by between 50 and 75 per cent.

The new bactericides gave only a slight reduction in infection.

A second disease was very prevalent on unsprayed mangoes, probably as a result of the very wet conditions experienced during the latter part of the season. This disease, which is caused by an unidentified fungus, resulted in a black tear-staining of the skin, thus rendering the fruit unsuitable for export.

In unsprayed fruit, the infection rate was 91 per cent, while fruit which had been sprayed with one of the fungicide preparations was almost completely free of the disease, 4 to 14 per cent of the fruit being only mildly infected.

Storage

The mango industry is becoming increasingly export-oriented. Unfortunately, mangoes are highly susceptible to spoilage and numerous problems are still experienced with storage. The influence of irradiation on the keeping quality of the fruit was again investigated in order to control post-harvest spoilage. Irradiation retarded the ripening of the fruit slightly, but the unirradiated fruit had a consistently better appearance.

The influence of different picking stages and storage temperatures on the keeping quality of Zill, Haden and Kent mangoes was again investigated. It appears that Zill mangoes have a poor keeping quality and therefore cannot be successfully exported by sea.

The trial also showed that mangoes which are picked when slightly riper and stored at 10 °C have the best appearance after a storage period of 31 days. There was a consistently high degree of spoilage in the fruit. It is clear that better control of the post-harvest spoilage of mangoes will first have to be achieved before this fruit can safely be shipped overseas.

An experiment was conducted to test the influence of various fungicides on the keeping quality of mangoes. The best spoilage control was obtained by immersing the fruit in hot (55 °C) solutions of mixtures of benomyl or thiabendazole with quintozone or dichloran for 5 minutes.

PAWPAWS

The pawpaw industry is very stable and horticultural problems are rare. The biggest problem facing the industry is that of obtaining uniform fruit of a high quality.

The pawpaw depends on cross-pollination, and good parent strains are quickly lost. This situation can be controlled to some extent by hand pollination over a number of years or by the production of cuttings from selected parent trees.

Storage

Trials were conducted to evaluate the influence of various fungicide treatments on the

keeping quality of pawpaws. The best control of post-harvest spoilage was obtained from fruit treated with a hot mixture of dichloran and thiabendazole. This treatment reduced spoilage in the fruit from 80,4 per cent (in the control) to 24,2 per cent.

LITCHIS

Where old litchi trees have declined and died owing to nematode infestation, a problem of poor growth is often experienced in young trees replanted in such sites. In order to find a solution to this problem, two replant sites were selected for experimentation. The first site had a population consisting predominantly of *Xiphinema brevicolle*, the dagger nematode, while at the second site *Hemicriconemoides mangiferae*, the ring nematode, predominated.

At both sites a special injector was used to inject methyl bromide and Telone (dichloropropene) into the soil. The methyl bromide treatment applied at the first site produced trees 25% taller than the untreated controls over a 5-year period. At the second site, the treatment with Telone produced trees 34% taller than the controls, while methyl bromide produced trees 25% taller than the controls.

Storage

Promising results in respect of post-harvest fungus control in litchis were obtained last season with the aid of certain fungicide combinations which were applied hot. These trials were repeated during the past season.

Post-harvest fungus growth was reduced by 50 per cent by immersing the fruit for 5 minutes in a hot (50 °C) solution of a mixture of dichloran and benomyl directly after harvesting. Combinations of quintozone and benomyl or thiabendazole reduced fungus growth by as much as 66 per cent.

These results are encouraging, but much more work will have to be done before the problems of post-harvest fungus growth and spoilage in litchis are solved satisfactorily.

GRANADILLAS

The grafting of the purple species *Passiflora edulis* onto the more resistant yellow species *P. edulis* forma *flavicarpa* to counteract *Phytophthora* root rot was very successful. Eighteen months after planting 53 per cent of the purple granadilla seedlings were already dead, compared with two per cent of the grafted plants.

PECAN NUTS

Trials with improved propagation techniques showed that young seedlings can be grafted very successfully. This method has definite advantages over budding. These two techniques now enable a nurseryman to propagate pecans over a longer period and also enable him to choose the method he wants to use.

Pecan aphids and sooty mould

During the past summer a number of pecan growers found their trees to be heavily attacked by a small yellow-green aphid which has been identified as *Monellia nigropunctata* Granovski. These insects secrete honey dew, which covers the leaves in a sticky, sugary solution. This in turn is an ideal medium for the growth of the sooty-mould fungus, which eventually covers the leaves in a black felt-like layer. This prevents photosynthesis, reduces yields and usually leads to premature leaf-drop.

A survey carried out in a Nelspruit pecan plantation revealed that there were very marked differences in the susceptibility of cultivars to sooty-mould, in spite of the presence of aphids on all cultivars. Ten cultivars were examined and graded for intensity of sooty-mould development on the leaves. The ability of trees to grow out of the infestation was also noted.

Mahan and Commanche were the most susceptible; Wichita, Apache and Choctaw were also fairly susceptible; Peruque, Bester and Desirable were relatively little affected; and Barton and Sioux were very resistant. Ant control can also be expected to ease the problem.

MACADAMIA NUTS

Trials are at present being conducted in collaboration with the CSIR to find the best methods of drying and roasting macadamia nuts for marketing.

A study of the fruit development of the nut showed that this takes place in two stages. During the first stage of 14 weeks growth takes place, while mainly chemical changes take place during the second stage of 17 weeks, which can be considered as the oil forming period.

SPICES AND MEDICINAL PLANTS

The adaptability of a large number of spices and medicinal plants, including *Vinca rosea*, *Bixa arellana*, *Rosmarinus officinalis*, *Cymbopogon citratus*, *Ocimum basilicum*, *Pelargonium graveolens* and *Lavandula* spp. was tested at Nelspruit.

In the glasshouse vanilla (*Vanilla planifolia*) flowers were successfully pollinated by hand, that resulted in the formation of pods that were harvested and dried.

Bixa arellana (the annatto pigment plant) aroused interest because of the large crop and the quality of the pigment which the plant produced. A start was also made with the distillation of essential oils from *Leptospermum citratum*, *Cymbopogon citratus* and *Zingiber officinale*.

A trial planting of ginger has already shown that ginger can be cultivated successfully in South Africa. A number of trial plantings on farms in various climatic areas have been established and promising results have been obtained.

TEA

The mechanical harvesting of tea gave a crop

increase of 33 per cent compared with conventional hand picking. Labour was drastically reduced through mechanisation. Although there was a slight drop in the percentage of high grade tea, this is offset by the higher yield and the labour saving.

A total of 22 selections from seedling material were established for later evaluation of types which give high quality tea.

COFFEE

The results of a coffee pruning trial showed that multiple stemmed coffee trees give a bigger crop than trees pruned according to the conventional single stem method which is used in certain countries.

It also appeared that drastic annual pruning results in a smaller crop, owing to our cold winter months, and the fact that there are only about eight months of active growth. Over the long term, light annual pruning followed by drastic pruning every fifth or sixth year for the multiple stemmed coffee trees gave the biggest crop.

VEGETABLES

The gross value of vegetable production rose to R89 million during the year under review - an increase of about 30%. The volume of production increased by less than 5% during the same year. It would appear that the perennial problem in the vegetable industry - overproduction and an unstable market - is being relieved.

One of the outstanding characteristics of the vegetable industry over the past year was the unprecedented interest in production under cover. It is encouraging that such a large number of prospective producers seek advice from the Department before starting production under cover. It is important to note that production under cover does not offer an alternative to the usual type of open air production. The two practices are not interchangeable. Production under cover is merely a very valuable supplementary practice where circumstances justify it.

In addition to an investigation into cultural techniques, the Department's research programme includes the study of a variety of structures, constructions and protective materials. Although a great deal of work still has to be done in this connection, the results obtained so far can be applied to great advantage in the industry.

NEW SERVICES

The Horticultural Research Institute has established a new vegetable section in the Eastern Cape and a horticulturist has been stationed at the Sundays River Research Station at Addo. Preliminary trials have already been planned and the work has been started. This section will meet an important need in vegetable research and provide advisory services for the most important irrigation areas of the Gamtoos, Sundays and Fish River Valleys, as well as for other river valleys of the Eastern Cape.

With the aid of water from the Hendrik Verwoerd Dam, this area is on the threshold of major development. Because there is a port of export nearby, processors are becoming increasingly interested in this area and one canning factory has already been established there.

TOMATOES

Canning tomatoes

A number of local breeding strains and a great deal of overseas material have been planted for purposes of selection. Selections from material from Portugal, specifically from the strain P4023, are showing great promise in respect of fruit quality, particularly from the point of view of the keeping quality of ripe fruit on the vine, which means that labour-intensive harvesting can be kept to a minimum. The firmness of the fruit is an outstanding characteristic which will facilitate bulk handling. The growth habit of these selections differs from that of the standard cultivar Roma VF in that they are more compact and bushy, which will necessitate adjustments in production practices.

New material from the University of California is also showing promise in respect of crop size, firmness and fruit quality. Further evaluation is necessary to determine the true potential of the material.

Two cultivar trials were carried out at Roodeplaat to compare some of the promising material with Roma VF. In both trials Roma VF showed that it is useful as a standard in that it is a cultivar which yields well. The breeding strains P4018, P4023 and P4024 did as well as or even better than Roma VF, provided double the number of plants were planted to allow for the smaller growth habit. In one trial Roma VF produced 65 tons of processing fruit, as against 63 tons for P4024.

Tomatoes were converted into paste by the National Food Research Institute of the CSIR. The consistency and quality of the paste was excellent in most cases. The breeding strains P4024, P4023, UC 134 and the cultivar Cal-J did best.

Market tomatoes

Material was planted for evaluation and selection. It is clear, however, that under present conditions a new cultivar or breeding strain will have to have outstanding qualities to do better than the generally recommended cultivar Heinz 1370. This cultivar bears well, and is noted for its adaptability in the various production areas and its fruit quality, particularly its firmness.

A new cultivar from the tomato breeding programme of the Horticultural Research Institute was released under the name of Karino.

Five cultivars and five breeding strains were compared with Heinz 1370 in a cultivar trial at Roodeplaat. The new cultivar Karino was found to perform better than Heinz 1370. Karino produced a lesion-free yield of 38 tons per ha as against the 35 tons produced by Heinz 1370. Although Piersol

gave the best yield 45 tons/ha), the lack of firmness and poor shape of the fruit (folds) make this cultivar unsuitable for fresh marketing. The breeding strain 1371-2-1 (Roodeplaat Albeto x Indiana 612 x Homestead) produced 44 tons of fruit, but unfortunately this strain has the disadvantage of uneven colouring during ripening. The new cultivar Letaba produced only 22 tons of fruit, chiefly because of its poor tolerance of leaf spot diseases such as early blight *Alternaria solani* during the wet summer months.

Cultivar evaluation trials at Glen and Nelspruit (winter production), like those at Roodeplaat, showed that the new cultivar Karino is a real acquisition. It produced the highest tonnage of lesion-free fruit in all cases. This, together with the firmness of its fruit, is the best characteristic of the cultivar.

Cultural studies

The trial in which various training methods were compared was repeated at Roodeplaat. The cultivars Manapal (indeterminate growth habit), Heinz 1370 (determinate growth habit) and Karino (determinate growth habit) were used to compare the following training methods: (a) plants trained up a single stake, (b) plants lying on banks, (c) plants lying on banks covered with grass, and (d) plants lying on banks covered with transparent plastic. The yield of lesion-free fruit was 66 tons per ha from plants lying on grass-covered banks and 64 tons from those on uncovered banks. Statistically these results did not differ. The trained plants produced 53 tons and those on plastic-covered banks 52 tons. The cultivars with a determinate growth habit (Heinz 1370 and Karino) were more suitable for the untrained treatments than those with an indeterminate growth habit (Manapal).

These results, together with those of the previous year, show that tomatoes can be grown in the summer rainfall area without training, provided determinate growers with firm fruit are used and the plants are established on banks to ensure that surplus water will drain away.

A trial was carried out to determine the effect of soil conditioners, which prevent the soil from becoming compacted, on the emergence of directly sown tomatoes. The preparation polyalkylamide (PAM) and a bituminous emulsion (Humofina) were tested. Spraying with 1 litre of the solution (1 part PAM : 7 parts water) per square metre produced a 65 per cent emergence of tomato seedlings 8 days after sowing; 10 days after sowing the figure was about 74 per cent. In the case of Humofina (1 part Humofina : 3 parts water) the emergence 8 days after sowing was 34 per cent - it was 8 per cent in the control. The effect on tomato seedling emergence of the PAM treatment and, to a lesser extent, the Humofina treatment, may be ascribed to the fact that the preparations preserve the crumb structure of the soil, whereas in the control the soil became compacted after irrigation.

Protected cultivation

Protected cultivation has been started. The project consisted of a cultivar evaluation and a comparison of fibre glass and polythene covers without any kind of heating. There were two plantings, viz on 3 April and 23 July. In the first planting the cultivar Extase produced 13 kg of lesion-free fruit per square metre under fibre glass and 14 kg of fruit under polythene. Other cultivars which gave good yields were Sonato and Winterbrid.

The results showed that far higher yields can be obtained under cover than in the open soil, viz about 140 tons per ha as against 60 tons. It was also possible to control diseases better under cover than in the open soil. Under cover cultivation could therefore make a great difference in production when protracted rains are experienced during the production season.

If the temperature in the protected structures is not controlled, the quality of the fruit can be seriously impaired by cold weather in winter and heat in summer.

Diseases

Stem rot of tomatoes, caused by *Sclerotinia sclerotiorum*, is new to South Africa. The disease occurred in the George area.

Bacterial canker - A method has been developed for testing tomato cultivars and breeding strains for resistance to canker, which is caused by *Corynebacterium michiganense*. The seedlings are inoculated with a minimum number of cells of the pathogen at a critical stage. The presence of resistance to canker in the breeding strains H2990 and L1051-1-2 was confirmed in this way. With one possible exception, the selections made from H2990 at the Horticultural Research Institute are as resistant to canker as the parent cultivar.

A preliminary trial revealed that a breeding strain from Japan, Okitsu Sozai No. 1, is more resistant than any of the tomato breeding strains and cultivars tested so far.

In a trial carried out in summer, the strain 344102 of *Lycopersicon pimpinellifolium* proved to be more resistant to canker than Roma VF, but when the trial was repeated in winter, no difference in resistance was observed.

Verticillium wilt - Surveys showed that *Verticillium dahliae* Kleb. occurs more generally in tomatoes than was originally supposed. The symptoms caused in tomatoes by this pathogen are generally unnoticeable and are not a reliable indication of the damage it does. It has been shown that the disease can result in crop losses of up to 20 per cent without any external symptoms being observed. Firstly, it has been found that wilting of the leaves and discoloration of the vascular tissue are the only symptoms that could be ascribed to *Verticillium* wilt with certainty under experimental conditions. Wilting of the leaves is a better criterion of infection, since wilting can be monitored repeatedly without damaging the plants.

ONIONS

Research is at present aimed at supplementing the early shortday cultivars with cultivars with a rounder bulb and better keeping quality. Good progress has been made and one promising breeding strain should be ready shortly.

Attempts are also being made to improve the standard cultivars Australian Brown and Caledon Globe, which are grown for export and storage.

Dehydrated onions are in demand throughout the world and interest is increasing locally as well. Breeding for dehydrator types and the evaluation of overseas cultivars also received attention. The qualities of importance in a good cultivar for dehydration include a solids content of 16 per cent or more, a white flesh colour, a high yield per hectare, a round to oblong shape and a storage life of two to three months.

The agricultural evaluation and dehydration of nine white and 3 promising straw-coloured cultivars were undertaken in co-operation with the CSIR. The performance of the three local straw-coloured cultivars was outstanding in respect of yield (33 to 36 tons per ha) and quality, and virtually no bolters were formed. The local white cultivar Alba produced a normal high yield of 30 tons per ha and the quality was good. All the imported white cultivars, which were virtually all F1 hybrids, were poorly adapted and produced low yields (3 to 23 tons). They all formed a high percentage of bolters (40% plus).

The results obtained with dehydration show that the 3 white cultivars known as Dehydrator Creosa, Dehydrator No. 8 and Dehydrator No. 4 produced a dry yield of 22 per cent, the highest in the trial. Alba gave a dry yield of 18 per cent, and the poorest yield in the trial was 9,8 per cent from the cultivar Alamo F₁ PRR. The local straw-coloured cultivars gave a dry yield of 13 to 16 per cent after dehydration, which is about the average. The quality of the dried product from the Dehydrator types was excellent, as was that of Alba. The colour of the dried product made from the local straw-coloured cultivars was unsatisfactory.

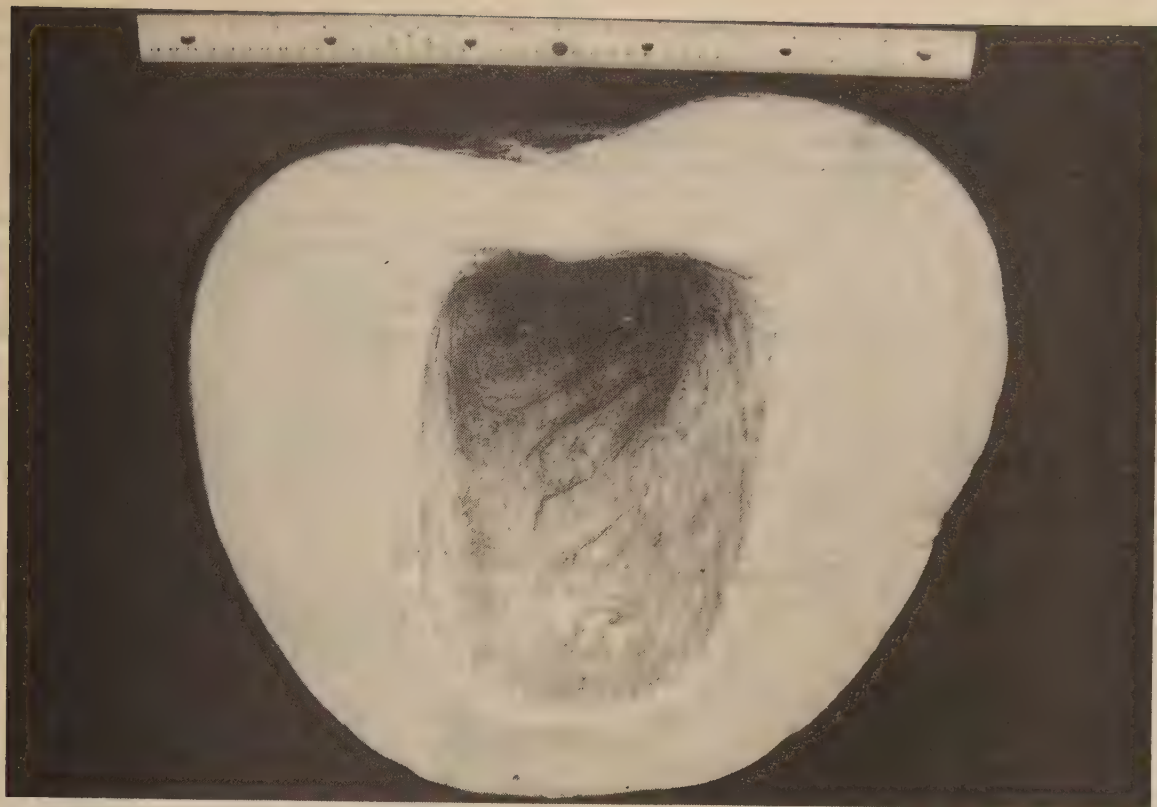
PUMPKINS

The best resistance to powdery mildew, the best quality and the best keeping quality were found in a field-pumpkin breeding strain with a fine-textured flesh about 130 mm thick at the thickest part. A yield of up to 60 tons per ha may be obtained from this pumpkin.

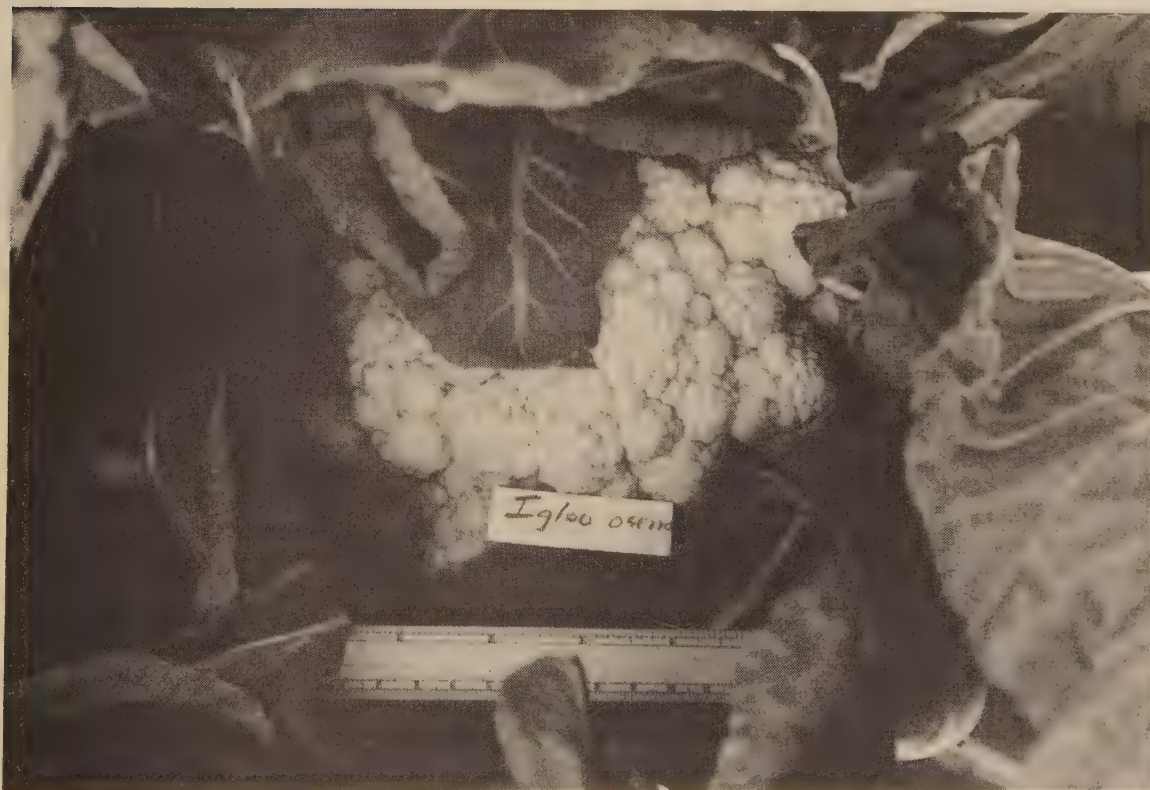
Since the breeding strains are still impure with regard to shape, an inbreeding and selection programme is being followed in order to obtain the further desirable quality of fruit uniformity.

GEM SQUASHES

Cultivar trials with the newly released squash Rolet, which retains its green colour for a long period, have shown that in most of the production areas (i.e. Roodeplaat, Nelspruit, Glen and Addo) it yields as well as or better than the usual gem squash varieties.



Intersection of a fruit of a hook-necked pumpkin with flesh of extremely high quality



Cauliflower head of the good cultivar Igloo-Osena

Diseases

Septoria leaf spot, which is caused by the fungus *Septoria cucurbitacearum*, is a new pumpkin disease which has been observed in both the Transvaal and the Free State. The disease has long been known in Rhodesia. *Cercospora* leaf spot has been observed on aubergines in the Malelane area. The disease is caused by *Cercospora solani melongenae*. As far as is known, this is the first time the disease has been observed in the Transvaal. The disease is known in Natal.

CAULIFLOWER

The biggest problem in the industry is the lack of early midseason cultivars (70 to 90 days) with the necessary head quality, head cover, growth vigour and adaptability.

The closing of a freezing factory in the Western Cape has compelled a number of farmers to leave the industry. Others expanded their production for the fresh market.

A few new cultivars such as Snow Crown, Self-blanche, Igloo-Osena, etc. were included in the evaluation trials at Roodeplaat. It would appear that Igloo-Osena is the only one of the new cultivars that can be used for commercial production. Igloo-Osena does not provide an answer to the problem of early cultivars, however, since it falls into the midseason group (90 - 110 days).

GREEN BEANS

Mechanical harvesters are being used to an increasing extent to save labour. A major problem in green bean production is bacterial blight *Pseudomonas* and *Xanthomonas* spp. anthracnose *Colletotrichum* spp. and bean rust *Uromyces* spp. The difficulty is to find cultivars that are resistant to these diseases, have the required pod quality and yield and can be harvested mechanically.

The cultivar Thor made a good showing during the past season at Roodeplaat, Nelspruit, Addo, Glen and Elsenburg. It produces fat, long pods of a fairly high quality and with hand picking yields of 20 tons per ha or more can be obtained. This cultivar also showed fairly good resistance to bacterial blight and brown rust.

There are a few disadvantages such as the pod colour (specially that of the jelly matter), which is not up to standard. Some of the pods also tend to be crooked. Mechanical harvesting is not as successful with Thor as with some of the other cultivars. It is nevertheless a very good cultivar for commercial green bean production in South Africa, not only for processing but also for the fresh market and home gardens.

Bacterial blight was a major problem in the George area, but not in the Transvaal and the Western Cape. Weekly spraying with mancozeb produced good results.

MUSKMELONS

The poor condition of muskmelons on arrival in London was again a problem. It is ascribed to

the fact that the available seed is not true-to-type. The next generation of selections, made during the previous season, was evaluated and inbred. The selections were considerably more uniform than the plants of the previous year and there were fewer light green muskmelons with a poor keeping quality.

Twenty new cultivars and strains from other countries were evaluated, but none of them did well with regard to adaptability and keeping quality. Morgan Melon, which comes from the USA, proved highly resistant to disease and may be used in the breeding programme.

In the breeding programme aimed at producing an export cultivar such as Ogen the crossbred progeny of Honeydew and Ogen again made the best showing. Some of the progeny appear very promising so far.

GREEN PEAS

The demand for processed - and especially frozen - green peas is increasing all the time and is estimated to have risen by 15 to 20 per cent during the past year.

In order to boost production, processing firms are trying to introduce more efficient production methods among producers and develop new production areas. Mechanisation in green pea production increased by about 20 per cent during the past year.

One of the chief problems of the inland irrigation areas is cold damage to the flowers, and especially to the pods, which hampers production to a greater or lesser extent every year.

Bollworm damage to the seeds still occurs and caused considerable losses during the past year - losses which one firm estimated at 10 per cent of the total crop.

Ascochyta blight *Ascochyta pisi* caused extensive losses in the South-Eastern Cape, as it usually does during a wet season.

Breeding strains derived from crosses made between 1953 and 1970 were further evaluated, especially with regard to seed properties, and new crosses were made between the best of the existing processing cultivars and 15 breeding strains from England and Germany. Seven of the imported breeding strains are more resistant to low temperatures, two produce large numbers of seed per pod, four produce large numbers of pods per plant, and two have leaves of a smaller size.

Research on techniques for determining the most suitable climatic areas for green pea production was continued. The results obtained so far show that cold weather, which damages flowers and pods, is the chief climatic factor responsible for a reduction in yields in the inland production areas, and that a reduction in yield can be expected when air temperatures reach 0 °C during the flowering stage. When the temperature falls below -3,5 °C during the flowering stage or later on, a complete crop failure can be expected.

LETTUCE

A lettuce planting was tested for virus infection and about a 60 per cent seed-borne

mosaic virus infection was found. Since this virus is a problem in lettuce in all parts of the world a close watch will have to be kept in future on its incidence in imported as well as locally produced lettuce seed.

SWEET POTATOES

Impala and Brondal are still the most popular of the standard cultivars in the Transvaal. In the Cape Province the yellow-skinned cultivars Koedoe and Borrie are preferred. The cultivar Kenya, which is still planted on a large scale, produced the extremely disappointing yield of 12 tons per ha. In addition, the sweet potatoes were cracked and had veins on the skin. A few new breeding strains gave outstanding results in various areas. The most promising breeding strains were 73-1-67, 73-1-75, 71-12-6, 71-10-37 and 73-1-103.

The breeding strain 73-1-67 is a red-skinned sweet potato with light orange flesh with creamy spots. It did well in the Transvaal and the Cape Province. The breeding strain 73-1-75, which is round and resembles a turnip, gave high yields at Roodeplaat and Outeniqua. Its keeping quality is very good. The breeding strain 71-10-37 is a white-skinned cultivar which showed great promise at Elsenburg, Outeniqua and Roodeplaat. The strain 71-12-6 has a smooth skin with a thick, waxy appearance. The flesh is white and the skin pink; this cultivar is preferred on the Pretoria market.

Virus-free material of a number of cultivars (206 000 vines in all) was made available this year to approved nurserymen to be multiplied and issued to the industry.

CABBAGE

The two breeding strains No. 1 and No. 2, which were selected from hybrid cabbage cultivars, again gave promising results at various research stations in the Transvaal and the Cape. The breeding strains are already very uniform. No. 1 showed slight susceptibility to black rot in the Lowveld. At this stage it would appear that No. 2 is the ideal strain for release as a new open-pollinated cultivar.

FLOWERS AND ORNAMENTAL PLANTS

POT PLANTS

Hypoestes aristata

This indigenous shrub, which shows distinct promise for production as a commercial flowering pot plant, was the subject of further intensive study. It has been shown for example that plants subjected to a night temperature of 17 °C and a day temperature of 25 °C flower after 9 weeks when given a day length of 9 hours. When the night temperature is 7 °C with a similar day length and day temperature, flowering takes as long as 19 weeks.

This is one of the few species which shows a marked difference in response to the growth regulants Cycocel and Ancymidol. Treatment with Cycocel results in a dwarfed plant with an open type of growth whereas with Ancymidol a more compressed and compact plant is produced. Leaf colour is very much improved by both treatments.

Pelargoniums

The response of Regal pelargoniums to low temperature treatment has been confirmed using older plants. Plants which had flowered the previous summer were pruned back after flowering and allowed to form fresh vegetative shoots. They were then placed in a cold room at 7 °C under 100 watt incandescent lamp suspended 300 mm above the plants and spaced 1 metre apart. The lamps were kept on continuously.

Plants were placed in the cold room towards the end of February and taken out early in April. They were then placed in a glasshouse at a day temperature of 24 °C and a night temperature of 12 °C. These plants began flowering early in May and flowered from the middle of May onwards, bearing from 5 to 8 trusses of flowers.

Cultivars which responded well were Grand Slam, Jones Distinction, Chérie, Burgundy, Strawberry Sundae, Red Copper, Cezanne, Carnival, Lily Langtry, Ella and Geoffrey Heard. Plants were about 300 mm high with a spread of from 350 to 400 mm.

Bougainvilleas

The potential of bougainvilleas for production as flowering pot plants has been further investigated. It has been shown that given the correct temperature conditions it is possible to produce flowering plants of the Crimson Jewel cultivar throughout the year.

Therefore with a day temperature of 24 °C and a night temperature not lower than 12 °C it is possible to have plants flowering in 120 mm diameter pots within five months of taking the cuttings. If cuttings are taken periodically throughout the year saleable plants can be available at any desired date to cater for market demand.

BREEDING SOUTH AFRICAN FLOWERING BULBS

Many South African flowering bulbs have been bred overseas and are grown commercially on a large scale. Well known examples are *Gladiolus*, *Tritonia*, *Freezia* and *Sparaxis*. However, there are many other South African bulbs with great potential. Some are already grown on a small scale, but owing to certain shortcomings there is little chance of their commercial value increasing. Since most of these problems can be solved by breeding, a breeding programme aimed at boosting the commercial potential of South African flowering bulbs has been started.

Lachenalias

Breeding with the genus *Lachenalia*, which is found in the winter rainfall area of the Cape Province, was started in 1965. A large number of pure species and variants have since been collected.

Numerous crossing combinations of various species with commercially important characters have been made. Promising plants were selected from these crossings and used in the breeding programme; they were taken to the F₂ generation and then through backcrossings with pure species. After further evaluation on the basis of flower size, flower colour, number of flowers, keeping quality etc. the best plants from all these crossings were retained and multiplied with a view to possibly releasing them to the flower industry. One very promising selection is being tested by flower bulb producers at present and will probably be released shortly.

Ornithogalums

The genus *Ornithogalum* comprises about 80 South African species. The biggest concentration of these species is found in the Cape Province. The South African *Ornithogalum* species fall into four main taxonomic groups. Leighton's miniature *maculatum* group comprises 21 separate species. This group is particularly important from a horticultural point of view in that it is extremely useful in ornamental horticulture and in the cut flower industry.

During the past few decades a large export market for flowers and bulbs has been built up overseas. Two species, *O. lacteum* and *O. thyrsoides*, were chiefly used for export. Both these species are white and what is required is not only breeding to create improved cultivars, but the transmission of the yellow and orange colours, which occur in other species, to the white species.

Gladioli

The gladiolus is one of the most important cut flowers in the world. In South Africa it is the third most important cut flower after chrysanthemums and carnations. The genus *Gladiolus* is found in Africa, Madagascar, the Mediterranean area and Europe; a few species occur in Asia. There are 103 South African species with 14 subspecies, 24 variants and a large number of ecotypes. The present cultivars are derived from crossings between various South African species, viz three winter-flowering and five summer-flowering species. The present cultivars therefore come from only eight of the 103 South African species. Since only a few species have been utilised so far, the potential for breeding new shapes is very great.

The present cultivars are subject to a wide variety of diseases. Intensive spraying programmes are required to control the diseases and this raises production costs considerably. Resistance to several diseases is found in some species, especially certain *G. natalensis* ecotypes. In the breeding

programme that was started recently as many pure species as possible are being collected and evaluated for resistance to a variety of diseases.

The bacteria that cause leaf spot, neck rot and scab of gladiolus have been identified as *Pseudomonas marginata* (McCulloch) Stapp.

VIRUS DISEASES OF FLOWERING PLANTS

Gerbera (Barberton daisy)

A disease that causes abnormal growth of Barberton daisy flowers has been identified as a virus-type disease, possibly a mycoplasma. The disease can be transmitted to healthy material by inoculation with diseased material.

Tissue culture studies with Barberton daisies were undertaken in an attempt to produce virus-free material by means of this technique. A tissue culture method by which a large number of plants can be obtained from parts of the receptacle has been developed. This technique will now be used, in combination with virus purification techniques, to develop disease-free material again.

Anthuriums

It has been established that flower parts and leaves that show abnormal growth are infected with an unknown virus.

PROTEAS

Exports of protea flowers have risen phenomenally over the past few years. The gross value of exported proteas was R342 000 in 1973/74; in 1974/75 the figure rose to R576 000, and then to R1 142 000 in 1975/76. If sales on other markets and sales of dried proteas are taken into account, total sales of proteas yielded about R3 million in 1975/76.

Culture studies

Good results were obtained with chemical manipulations aimed at changing the flowering time of *Leucospermum* to the summer months. Various aerial grafting techniques and the topworking of orchards by means of grafting and budding were investigated and the findings were very promising.

Selections of high quality summer-flowering *Protea repens* were made and should be of great value to the industry in future. A silver tree *Leucadendron argenteum* selection that appears to be considerably more resistant to poor growing conditions than the present type was also found.

The successful chemical manipulation of *Leucospermum* spp. seed to boost the germination percentage considerably was another breakthrough in the propagation of proteas. This technique makes the *in situ* sowing of *Leucospermum* seed possible as well.

Another important line of research which is producing promising results is simultaneous production by grafting proteas and rooting the rootstocks. A big crossing programme aimed at

producing late-flowering varieties of a high quality was carried out. The programme included 60 interspecies and variant crossing combinations.

ROSES

Determinations of the affinity between rose rootstocks and cultivars were started. Preliminary trials showed that various cultivars do not react in the same way to a specific rootstock.

The following rose rootstocks were tested in glasshouses for resistance to *Verticillium* wilt: Iowa 60-5, Iowa 54 364/1, Iowa D20, Natal Briar, Flora Dale 6, *Rosa canina*, *R. indica major*, *R. polimeriana*, *R. multiflora* and *R. manetti*. The last four showed resistance and will undergo more extensive testing. All the other rootstocks showed serious dieback after infection.

Basye 3, which showed resistance last season, was tested on a larger scale and again showed

resistance. However, cases where scions budded on Basye 3 showed symptoms of *Verticillium* wilt have come to the attention of the Institute. This has given rise to the supposition that Basye 3 is tolerant rather than resistant. This possibility is being investigated at present.

Virus-free rose propagating material - A panel of rose growers chose 30 new floribunda and tea rose cultivars for virus purification. 147 000 virus-free rose rootstock cuttings were released to the industry this year. Virus-free material was also supplied to research institutes and growers in England, Denmark and Australia.

FUCHSIAS

A rust caused by *Pucciniastrum epilobii* f. sp. *palustris* has been observed on fuchsias. This pathogen is well-known, particularly in Holland.

6. Animal Science

BEEF CATTLE

According to estimates by the Division of Agricultural Production Economics, the number of cattle owned by Whites stood at 8 990 000 in May 1976. This represents a 24,9 per cent increase in the cattle population over the past seven years after many decades during which cattle numbers remained virtually static.

Perhaps more significant than this increase in numbers, however, is the marked change in the distribution of cattle over the past fifteen years.

CATTLE MOVEMENTS, 1961-1973

A very pronounced movement of cattle from the traditional extensive ranching areas to the more intensive higher rainfall areas is evident. This trend must indicate the pattern for work on beef production in the immediate future. Production practices are bound to intensify.

REPRODUCTION

The financial success of virtually all livestock enterprises is basically dependent on the rate of reproduction.

Departmental herds throughout the country in both extensive and intensive areas illustrate that the low calving percentage for the country as a whole, commonly estimated at between 40 and 60 per cent, need not necessarily be accepted as insurmountable.

At Mara in a long-term cross-breeding comparison purebreds of both exotic and indigenous breeds achieved calving percentages of well over 80 and their crossbreds were even better over the past season. At Soutpan the conception rate of lactating crossbred cows was 92 per cent over the past year, while that for heifers was 86 per cent. Departmental herds in the Eastern Cape reported 98 per cent calving under sweet veld conditions.

Under more intensive conditions at Athole in the Eastern Transvaal reconception of cows was 90 per cent, Potchefstroom Research Institute reported 95 per cent reconception in beef herds and on the Springbok Flats 92 per cent conception was obtained from a herd of 92 cows.

These figures illustrate, as do the achievements of many well run farming enterprises throughout the country, that fertility is largely a matter of good management and nutrition and that sufficient attention to these aspects by all beef

producers would put beef production on a sound footing in South Africa.

In Natal a close relationship between the percentage conception and live mass at the beginning and end of the breeding season was statistically established.

In the Winter Rainfall Region at the Nortier Experimental Farm treatment of cows with copper had no beneficial effect on fertility. At Tygerhoek a project has been initiated to induce multiple births in beef animals by hormone treatment.

Fertility in the male is receiving attention in semen investigations by workers at Irene, in collaboration with the section responsible for Phase C of the National Beef Cattle Performance and Progeny Testing Scheme. Semen samples from 372 young bulls at the Irene and Armoedsvlakte Bull Testing Stations have been collected over the past year. Results are promising and consideration will be given to the possibility of the routine incorporation of such tests in the testing scheme. Electrical stimulation was used in the collection of semen from adult bulls, with very satisfactory results.

NUTRITION

Few will disagree that poor nutrition is the fundamental obstacle in the way of the development of beef production in South Africa, both in the extensive ranching areas and in the more intensive higher rainfall regions.

In the extensive areas where the natural vegetation is the sole or major source of nutrition for beef cattle, the chief aim of investigational work in this field is to ascertain the optimal utilisation of the natural resources through grazing control and strategic supplementary feeding.

In South-West Africa work in sweet veld areas is now aimed at marketing a finished 2-year-old off the veld.

Perhaps the most convincing demonstration that efficiency of beef production can be achieved under extensive ranching conditions through correct veld control and good herd management is to be found on the 1 880 ha demonstration ranch Soutpan in the mixed bushveld of the Transvaal Region. Over a period of seven years the annual net production of live mass at Soutpan has increased from 17,9 kg/ha to 30,5 kg/ha. The average live mass sold per year over the past 5 years stands at 28,7 kg/ha, the average calving percentage was 85 and the average weaning mass at 205 days was 195 kg. The only supplement fed is a



Young beef-breed oxen in good condition. They are being finished on *Eragrostis* grazing plus maize meal. The photograph was taken at the Dohne Research Station

mineral protein lick to which the cattle have free access and which was consumed at an average of 85 g per head per day over the past year.

Good veld management of the sweet veld at Mara in the Northern Transvaal ensures very satisfactory weaning masses and high fertility. Crossbred weaners run off the veld averaged well over 200 kg at 196 days.

Work has also indicated that the productivity of the natural veld can be considerably enhanced by strategic supplementation and/or fertilisation, particularly where conditions are not very extensive. In the northern lowveld of SWA, at the Uitkomst Experiment Station, an investigation incorporating improved grazing control, combined with camp rotation and strategic supplementation, has resulted in a marked improvement in the local problem of long calving intervals.

Under highveld conditions at Potchefstroom the carrying capacity of veld was doubled when 60 kg N/ha and 10 kg P/ha were applied. At the same time very satisfactory fertility was maintained in the grazing beef cows; the weaning masses of their calves were also satisfactory.

In the Eastern Cape Region at Dohne, where beef steers were finished on veld grazing, one group which was fed maize meal to meet 25 per cent of their requirements averaged an increase of 75,4 kg/ha in carcase mass, compared with an average of 49,0 kg/ha for a group fed no maize meal supplement.

On the Springbok Flats in the Transvaal Region a herd grazing veld but with access to

Cenchrus ciliaris grazing produced 53,8 kg/ha live mass compared to a herd on veld alone, which achieved a net live mass production of 36,8 kg/ha.

Intensive feeding, either on pastures or in the feedlot, has received attention. At Potchefstroom various ensilage/concentrate ratios in rations for the finishing of weaners, and the efficiency of milled as against whole maize, were compared. The digestibility of high concentrate rations containing maize meal was slightly superior (TDN 77,65%) to that of rations containing whole maize (TDN 77,36%).

Average daily gains of oxen finished on these rations were 1,11 and 1,04 kg for milled and whole maize rations respectively. Good results were also obtained by replacing a conventional high-protein concentrate with a mixture of 96 parts coarsely milled lucerne and 4 parts urea fed at the rate of 1,8 kg per ox per day. Steers finished on *E. curvula* pasture at Dohne achieved an increase in carcase mass of 233,6 kg/ha, and another group with an additional supplement of maize meal fed at the rate of 25 per cent of their requirements showed an increase of 352,8 kg/ha. The workers concerned emphasised the superiority in carcase grading of the animals that were fed meal. In Natal an average daily gain of 0,97 kg was achieved by weaners finished on a rye grass pasture alone.

At Athole in the Eastern Transvaal weaning masses of 250 kg at 240 days and very satisfactory reproductive performances were obtained from beef cows on artificial pastures carrying 4 LSU per ha. In Natal two beef herds were carried on kikuyu

pasture at two stocking rates, viz 3 and 6,6 LSU/ha. Although milk production per cow over five months was appreciably higher from cows on the lower stocking rate, the satisfactory rate of gain of 0,81 kg/day per calf of the herd on the high stocking rate compared with 0,99 kg/day for the low stocking rate suggests greater productivity from a beef enterprise on the higher stocking rate.

Maize silage together with a winter lick was compared with *E. curvula* hay fed *ad lib.* for winter feeding of 18-month-old replacement heifers in the Natal Region. In terms of winter gains the silage-fed group was superior (ADG : 0,60 kg/head) to the hay-fed group (ADG : 0,34 kg/head). Although subsequent gains on summer veld were greater for the hay-fed group (ADG : 0,48 compared with ADG : 0,37), the eventual average conception rate of 81,5 per cent for the silage-fed group was superior to the average of 69,0 per cent for the hay-fed group.

BREED EVALUATION AND CATTLE IMPROVEMENT

The breed evaluation programme at Vaalharts is still in progress and the first phase of evaluation of different F1 Africander cross female animals has been finalised. A summary of the results obtained is given in Table 1 below.

The results of the performance of the bull breeds involved were analysed and indexed, making provision for a penalty for calving problems in evaluating their potential for producing crossbred breeding animals. See Table 2 below.

The subsequent team of crossbreds from Africander cows were served for the first time during the past year. The relevant masses prior to service are indicated in Table 3 below.

The male contemporaries of these females were evaluated on performance in the feedlot at Irene. All four crossbred groups achieved better rates of gain and efficiency of feed conversion than contemporary Africanders, and the Charolais crosses outperformed the Blonde d'Aquitaine and the Limousin crossbreds.

Of the crossbreds, the Chianina crosses fared the worst when the important considerations in carcass evaluation were compared and also had the highest proportion of bone and the lowest proportion of beef in the carcass. The eating qualities of meat from the Africanders and the

Limousin crossbred herds were superior to those of the other crossbreds.

The following year's programme included serving Africander cows with Simmentaler, Gelbvieh and Limousin semen and the crossbred heifers are now being raised. No cows served with Simmentaler semen had calving problems, whereas 21,7% of the cows carrying Gelbvieh and 10,5% of those carrying Limousin crossbred calves had to be helped at calving.

During the 1976 season 160 Africander cows were inseminated with semen from Blonde d'Aquitaine, Limousin, Normandie and Maine Anjou semen.

At Mara the investigation of long-term crossbreeding systems in beef production, using the parent breeds for comparison, is continuing. In the crisscrossing system the indigenous breed (Africander) has been introduced for the third time, and the second cycle of the three-breed rotation has one season to go.

The following is a summary of some of the results obtained over the past two seasons.

Breed	Calving %	196 Day weaning mass (kg)
Africander	82	184
Hereford	90	171
Bonsmara	88	210
Simmentaler	85	226
Criss-cross Afr. x Sim.	94	215
Criss-cross Afr. x Hereford	88	207
Rotational cross (A x H x S)	90	224

In an experiment on the winter feeding of herd replacements in the Natal Region a comparison between Simmentaler and Sussex heifers produced interesting results. See Table 4.

In a comparison with young Africander bulls in feedlots at Irene, Nguni bulls grew 29,4 per cent faster and consumed 12,8 per cent less feed per unit of mass increase. At slaughter Nguni carcasses had a fat content of 20,5 per cent compared with 13,2 per cent for the Africanders, but all the carcasses of both breeds graded Super.

The leather qualities and hide yield of young Friesland and Africander oxen were investigated by staff at Irene in collaboration with the Leather Research Institute in Grahamstown. Relative to carcass mass Friesland hide yield was 6,1 per cent compared with 8,8 per cent for the Africanders.

TABLE 1

Breed	Africander	Brahman x Africander	Charolais x Africander	Hereford x Africander	Simmentaler x Africander
Production index	9,63	31,22	22,43	30,65	39,61
Yield per 450 kg cow per ha in R	3,29	6,0	4,54	5,21	6,37

TABLE 2

Bull Breed	Africander	Brahman	Charolais	Hereford	Simmentaler
Production index	100	195	125	149	210

TABLE 3

Breed	Africander	Blonde d'Aquitaine x Afr.	Charolais x Afr.	Chianina x Afr.	Limousin x Afr.
Av. mass at service (kg)	360	422	436	397	394

TABLE 4 — Measure of performance	A.D.G.(Winter)		A.D.G.(Summer)		Subsequent calving %	
	Simm.	Sussex	Simm.	Sussex	Simm.	Sussex
Winter silage feeding	0,63	0,56	0,32	0,42	77	86
Winter hay feeding	0,35	0,32	0,53	0,43	67	71

Relative leather yield of raw hides slightly favoured the Africander, but in terms of strength and of the leather qualities the Friesland hides were superior.

It was ascertained that the muscles of Africanders contain a higher concentration of collagen with a higher solubility than those of Frieslands.

The investigations into the nature and inheritance of laminitis in Africander cattle at Irene is continuing.

The National Beef Cattle Performance and Progeny Testing Scheme continues to play an important role in the exploitation of the beef production potential of the Republic. The membership is still increasing and participation now stands at 1 153 breeders, 71,9 per cent of the cows involved being grades.

The 4 bull testing stations were well patronised, with 94,7 per cent utilisation of facilities, and the growth testing of bulls on the farms of breeders (Phase D) also expanded.

A total of 2 815 bulls were tested over the past year, 744 more than in 1974/75.

In the course of the past year a more comprehensive computer programme came into operation, an important modification of the Phase C technique for testing bulls was introduced, Phase E (provision of facilities for carcase evaluation) made its debut and the construction of a fifth bull testing station - at Cedara - was begun. Extensions to the facilities at Armoedsvlakte and major modifications to the stables at Irene are also being undertaken.

CARCASE REFRIGERATION AND MEAT QUALITY

At the request of the carcase refrigeration industry in South Africa the methods that should be used to refrigerate beef carcasses after slaughtering and their effect on the cooling rate, loss of mass, growth of micro-organisms and meat quality of such carcasses are being investigated in the course of a joint project undertaken by the Animal and Dairy Science Research Institute, the Veterinary Research Institute and the CSIR. The results obtained so far showed that the loss of mass is greater during refrigeration at lower temperatures, lower humidity and higher air velocity. It was also found that muscles contract severely (cold shortening) if they reach temperatures of under 10 °C while the pH is still above 6,0 and that the meat is then very tough when cooked. Because smaller beef carcasses cool down faster than bigger carcasses, meat from the former was found to be a lot tougher. Meat from carcasses refrigerated at 0 °C was 53 per cent tougher than that from carcasses refrigerated at 7 °C. Even after 7 days' aging the difference was still 43 per cent. The higher the cooking temperature

the more marked the difference in toughness. Toughness was also directly linked to the length of the muscle fibre sarcomeres, which are the contractile units of the muscles.

MUSCLE HISTOLOGY AND MEAT QUALITY

The size of muscle fibres in Africanders and Frieslands was measured in the muscles of animals slaughtered between birth and 22 months. In Frieslands a peak in muscle fibre size was reached by 10 months, but in Africanders this peak came only at 14 months, which is an indication of the earlier physiological maturity of the Frieslands. At all the ages compared the muscles of Frieslands had a larger proportion of white muscle fibres than intermediary and red muscle fibres. Early development of white muscle fibres is typical of early physiological development of muscles - in this case of the muscles of the Frieslands.

DAIRY CATTLE

It may be assumed that the prevailing economic conditions and the rises in the prices of fresh milk and dairy products are contributing to consumer resistance. It has gradually become clear that continual price increases to encourage production have not resulted in the desired stability. The price adjustments which were to serve both to stimulate production and to give the established producer a better income attracted many new producers to the industry. The very high level of production at present may necessitate adjustments which will be particularly hard on those producers who have concentrated on dairy production throughout and borne the brunt of the problems and risks of the dairy industry over the years.

South Africa's problems in respect of its excessive stocks of Cheddar cheese and milk powder are being aggravated by Britain's membership of the EEC, which has meant an almost complete loss of one of the Republic's most important sales areas.

MILK RECORDING SCHEME

The very important developments of the past year are indicative of a new phase in the history of the scheme.

The donation of R40 000 by the industry (the Milk and Dairy Boards) to promote milk recording and the establishment of a Central Milk Recording Co-operative to control and distribute these funds, together with the central testing of not only butterfat but also protein and lactose, are regarded as the most important developments.

In addition to the 514 728 butterfat tests, which is an increase of 12 per cent in comparison

with the previous year, official tests for protein and lactose (84 408 in all) were also carried out for the first time in the history of the scheme.

The number of herds tested increased by 9,5 per cent. 62 575 completed lactations were recorded, as against 60 000 the previous year, and the number of owner samples rose by 95 896 to 314 160. Three of the five official milk recording co-operatives were in a position to test for protein by the end of the year under review, and one co-operative performed this service throughout the year under review.

The breeding value of 277 dairy breed bulls has been established.

FEEDING

A computer programme for determining the quantity of concentrate supplementation for dairy cows at various roughage feeding levels has been written and tested in Natal. The programme takes into account only the energy requirement of the animals, based on standards drawn up by the Agriculture Research Council of Britain. With the aid of this programme 699 charts for supplementary feeding of dairy cows were issued to 169 farmers.

Maize germinated and grown under various hydroponic systems was chemically analysed by the Potchefstroom College of Agriculture. The percentage of the nitrogen constituted by the NPN fractions increased from 9 per cent in the grain to 25 per cent in the 12-day-old plant. According to *in vitro* studies the digestibility of organic matter

dropped from 85 per cent for grain before it had been subjected to hydroponic culture, to 79 per cent for the 12-day-old plants, to 70 per cent for the plants which had produced twice as much dry matter as the original grain. The average crude protein content of samples collected on grass clover pastures for dairy cows at Potchefstroom from October to January was 27,28 per cent for the clovers and 15,66 per cent for the fescue. In the clovers 22,75 per cent of this crude protein was in the form of NPN and in the case of grasses the figure was 17,07 per cent. *In vitro* studies produced digestibility coefficients for organic matter of 75,8 per cent for the clovers and 63,1 per cent for the fescue.

A management trial with growing dairy breed heifers in the Winter Rainfall Region revealed that there is no economic justification for rearing heifers at too high a nutritional level in order to obtain earlier puberty and conception.

A light harness (mass 3,5 kg) for catching manure was developed for use in metabolism studies with dairy cows at the Animal and Dairy Science Research Institute.

A trial at the Glen College of Agriculture revealed that the daily milk production of heifers with their first calf from the 10th to the 60th day after calving increased by 12 per cent in cases where lucerne hay constituted 40 to 80 per cent of the total ration. Peak production is obtained 60 days after calving, after which production drops at a rate of 3 to 4 per cent per month. On a high concentrate ration (20 per cent lucerne: 80 per cent concentrates) the daily milk production of heifers



The new Animal Science complex for dairy cattle at Elsenburg. It includes *inter alia* an arena for judging, demonstrations and auctions

with their first calves increased by 27 per cent from the 10th to the 150th day of lactation. After this production dropped at a rate of 2 per cent a month. From the point of view of production and economics, high concentrate feeding for heifers calving for the first time appears to have produced the best results, despite the relatively low butterfat content (3,11 per cent) of the milk.

MANAGEMENT

The effect of milking intervals of 12, 16, 20 and 24 hours on the milk production of Friesland cows was studied at the Animal and Dairy Science Research Institute. Milk, fat and protein production were respectively 6,4, 5,8 and 1,6 per cent lower at the 16-hour interval than at the 12-hour interval. At the 20-hour interval production was respectively 16,1, 10,7 and 11,2 per cent lower and at the 24-hour interval production was 32,6, 27,1 and 29,0 per cent lower than at the 12-hour interval. Sodium concentration was 10,1, 25,3 and 44,5 per cent higher at the 16, 20 and 24-hour intervals respectively than at the 12-hour interval.

DAIRYING

MILK

A pilot scheme for buying milk on a quality basis was launched at Elsenburg and at a factory at Heilbron during the year under review. These trials concerned chiefly the organisation, procedure and techniques (including sampling techniques) required for the chemical and bacteriological analysis of milk. It is intended to centralise such laboratories (and this will involve the milk recording scheme as well) so that they can play their part in milk production extension.

The infrared method of analysing fat, proteins and lactose is just as suitable for 10-day composite and preserved samples as for unpreserved fresh samples. The preservatives used were potassium bichromate and mercuric chloride.

Regular lactose determination for individual cows promises to be an extremely useful early indicator of mastitis and one which, together with corroboratory work by veterinarians, could give the campaign to control this erosion condition new impetus.

The standard method of determining psychrotrophic bacteria in refrigerated milk takes 7 days. A modified method has been designed and culture plates at 15 °C for 2 days and 7 °C for 1 day, or 15 °C for 3 days, showed a good correlation with the standard method. In trials to test three growth media for the determination of the number of proteolytic bacteria in refrigerated milk, it was found that owing to high proteolytic activity a water agar plus 5 per cent skim milk makes a suitable and cheap medium. In comparison with the standard method agar the total count is lower, however.

An equation for the relationship between the average exponential bacterial count and the

methylene blue reduction time for refrigerated and unrefrigerated milk was derived for a specific accuracy interval. It was determined from this equation that 5 or 6 samples of refrigerated milk and 3 samples of unrefrigerated milk are required per month to get a quality limit with a 10-fold difference.

The milk composition and the production of cows that were not milked on one or two successive days a week showed that, although the weekly production was not affected, the total protein, casein and non-casein protein increased. The calcium and soluble phosphates decreased and the sodium and chloride content rose.

A study on udder secretions during normal, suspended and resumed milking was undertaken, with the emphasis on the functional qualities of the udder epithelium. There is a direct relationship between the pH values of the secretion and the concentration of sodium, chlorine, non-casein protein and total protein; the pH and the concentrations of potassium, lactose, calcium and magnesium show an inverse relationship. The resumption of milking in two quarters of the udder stimulates the synthesis of constituents in the other two quarters. The results show that the composition and quantity of the secretions are regulated by various mechanisms.

The bulk storage and transportation of milk creates the problem that water is added as a result of residual water in pipe lines. This water can be traced by using the freezing point of milk. In an investigation of 488 samples of herd milk produced under supervision, the normal freezing point was found to be $-0,537 \pm 0,0086$ °C. For legal purposes $-0,530$ °C therefore remains the officially accepted freezing point for milk in South Africa.

In the course of a survey to determine the quantities of copper, iron and free fatty acids in milk supplied by producers, large differences in the amounts of copper and free fatty acids were found, depending on the milking method used, as Table 5 shows.

These constituents cause oxidation and rancidity in milk and dairy products. The high values for some milking machines are ascribed to incorrect or poor installation.

Individual differences between dairy cows regarding the quantity and quality of protein in the milk, and the way this is affected by genetic and external factors, are being studied. As the study progresses it is intended to use identical twins and to determine all twenty amino acids in milk simultaneously with the aid of the gas chromatograph. Progress has been such that the determination of individual amino acids is included in the larger investigation into variations in the amino acid composition of the various protein fractions in milk produced by different cows under different conditions.

CHEESE

A bacteriophage-inhibiting medium for cheese starter cultures was successfully prepared. The

TABLE 5 - The copper and free fatty acids contents of producers' milk for two milking methods

Class Interval	Copper - $\mu\text{g}/\ell$ Frequency %		Class interval	Free fatty acids - ml 0,1N NaOH/100 g of fat Frequency %	
	Hand milking	Machine milking		Hand milking	Machine milking
15 - 30	30,6	24,3	0 - 0,3	1,1	4,1
30 - 45	30,6	29,7	0,3 - 0,6	55,1	35,6
45 - 60	29,5	24,3	0,6 - 0,9	36,0	32,9
60 - 75	4,5	5,4	0,9 - 1,2	6,7	12,3
>75	4,7	16,3	>1,2	1,1	15,1

medium was found suitable for culturing mesophilic starter streptococci since it inhibits bacteriophage and stimulates bacterial growth (activity). It was established that some bacteriophage of the lactic acid streptococci can lyse the host cells in the absence of calcium ions. This medium is cheaper and could be made cheaper still by omitting one of the components.

A further eight starters were prepared for South African conditions; they consist of two or three single strain and bacteriophage-unrelated isolates of *Streptococcus cremoris* and/or *Streptococcus lactis* and/or *Streptococcus diacetylactis*. The starter was successfully used for manufacturing Gouda cheese. And investigation into the bacteriological composition of commercial cheese starters revealed that a change had taken place in comparison with previous years. *Streptococcus cremoris* is the dominant species at present, and *S. diacetylactis* does not occur. Where *S. diacetylactis* does occur, it is in small numbers.

In a study of the propionibacteria in Gouda cheese, one of the types of bacteria that produce gas in cheese, it was found that the specific growth rates and generation times vary from 6,0 to 48,0 hours. The incidence of this type of bacteria in South African cheese varieties is lower than originally supposed. The bacteria are more numerous in winter and late gas formation cannot be ascribed to these bacteria.

A quick test for high concentrations of propionibacteria has been developed; it involves the analysis of the fatty acid content of cheese by means of gas chromatography. Gas formation by certain spore-forming bacteria, where the production of butyric acid is typical, is also being investigated.

Twenty species of propionibacteria were selected on the basis of the amino acid and carbohydrate composition of the cell wall. The presence of muramic acid, glutamic acid, diaminopimelic acid and alanin was established and two groups can be clearly distinguished on the ground of the amount of alanin present. It was possible to distinguish between species by means of the cell wall carbohydrates. Although certain species in group 1 (high alanin content) are used in cheese starters, there are others that would also be suitable but are unknown to cheese-makers.

The effect of temperature, fat content and the type of pack on the degree of ripeness of mature Cheddar cheese was determined; the criterion used was soluble nitrogen, total free amino acids, free tyrosine and free fatty acids. The increase in the soluble nitrogen and free tyrosine bears a logarithmic relation to the ripening period and

depends largely on temperature. The degree of ripening can therefore be determined through the extent of protein breakdown and by means of soluble nitrogen. It was, however, not possible to deduce a norm for flavour development from the results.

Film-packed, normally ripened cheese did not differ discernibly in loss of yield from film-packed mature cheese.

BUTTER

The Institute assisted certain creameries in developing and manufacturing aroma butter. The problem of high viscosity in the cultured cream and consequent problems in handling this cream with the existing equipment led to changes in the temperature treatment procedure to achieve better fluidity. The mixing of fresh cream with cultured cream to obtain a higher pH and better fluidity produced good results, without producing lower diacetyl values than the required minimum. The danger of oxidation defects was also reduced. A rapid method of determining free fatty acids in cream was developed for selection purposes.

There are indications that the copper content of butter has dropped significantly since the last survey (1968). This may be ascribed to the increased use of stainless steel and to the fact that proportionally more factory cream than farm cream is made into butter. The use of changes in the non-conjugated diene unsaturated fatty acids during storage as a criterion for oxidation of butterfat is being investigated.

OTHER MILK PRODUCTS

The study of techniques for recovering whey proteins with the aid of ultrafiltration equipment was continued. This included the manufacture of products from whey with various compositions. In co-operation with the Department of Health a power was developed from whey proteins containing prescribed quantities of lactose and fat. The nutritional value of this powder was determined and certain physiological tests carried out. Pure lactose crystals or powder and cattle licks were manufactured from excess lactose.

The concentration of skim milk for cheese-making is being tested. This would have the potential advantage of improving both the cheese yield and the nutritional value of cheese a great deal, and curtailing the conventional process of cheese-making considerably.

Instability in the milk protein in milk as a result of a mineral imbalance has been reported from various factories, principally when the milk is

evaporated. Recommendations on the feeding of cows and the treatment of such milk were made.

The ultra high temperature (UHT) treatment of milk is now applied in three factories in South Africa and the quality control of the process is monitored by the Institute. The type of micro-organisms that survive UHT treatment is being established at present.

The bacteriological quality of commercial sterilised milk is being investigated and tests to determine perishability have been designed. The definition of sterilised milk in the regulations, i.e. milk free from viable organisms, will have to be reviewed in the light of the findings of this investigation.

QUALITY IMPROVEMENT SERVICE

During the year under review there was a further increase in the number of dairy products, the number of samples and quality characteristics. The following changes were made in the butter analysis service:

- The point system was changed, and in organoleptic judging the type of flavour is now also specified.
- The carbonyl value was replaced by the copper content.
- The spreadability of butter and the diacetyl value of aroma butter are also specified. The number of characteristics analysed in order to determine quality and the number of samples of the various products that were analysed were as follows:

Product	Number of characteristics investigated	Number of samples
Butter	12	320
UHT* milk	Sterility test	204
UHT puddings	Sterility test	69
Milk powder	6	95
Cheese	10	196

* Ultra high temperature

The quality of cheese and milk powder was good on the whole. The UHT milk was free of bacteria virtually without exception. A few cases of bitter milk were found, however. The quality of the butter was disappointing in many respects.

SHEEP AND WOOL

The National Mutton Sheep Performance and Progeny Testing Scheme

MUTTON SHEEP

During the past year dual-purpose sheep breeds such as the Ile de France, Suffolk and Dorset Horn were included in the scheme, which increased the number of active collaborators from 26 to 37.

In addition to the routine processing of data on 7 347 ram lambs, 9 394 rams and ewes were

selected on the basis of performance test data. In a controlled observation in one of the collaborating flocks it was confirmed that the method of measuring the growth rate, and selection for this character, raised the productivity of Dorper ewes by 56 per cent in comparison with subjective methods of measurement and selection.

WOOLLED SHEEP

A record number of 17 629 wool and mohair samples were analysed at the fleece testing centre during the year under review - an increase of 3 254 as against the previous year.

The membership increased by 13, to 85, and an additional 12 applications had been received by the end of the year. This expansion is ascribed to sustained extension work.

Successful courses and lectures on performance testing were held; they were attended by 505 interested persons. The Dohne Merino meeting, which lasted a week and was attended by 109 breeders, was the highlight.

FEEDING

At Potchefstroom lambs weaned early (6 to 8 weeks) were fed rations based on maize silage up to slaughtering age (37 kg live mass). The highest voluntary intake was obtained with a 60:40 silage: concentrate ratio and the lambs took in 3,5 per cent of their live mass daily in terms of nutrient dry matter. Daily increases exceeded 200 g and good carcasses were produced.

Veld fertilising raised the total nitrogen content of the grass, but it was principally the non-protein nitrogen fraction of the grazing that was increased.

Trials with wet ewes on winter veld at Dohne have shown that nitrogen and energy supplementation in the form of licks is not a satisfactory way of maintaining the live mass of the ewes and the growth of the lambs.

In feeding trials at the Neudam Research Station it was found that Karakul lambs can be weaned at 6 weeks without any difficulty, provided they receive creep feeding at an early stage and a high-protein ration after weaning. It was also found that in good feeding conditions the length of the suckling period has no effect on the *post-partum* sexual activity of the ewes.

A comparative study of various sources of phosphorus used as supplementation for Merino wethers on karoo grazing showed no significant differences between dicalcium phosphate, monosodium phosphate and bone meal. It was also found that the accepted phosphorus requirements of Merino sheep on Karoo grazing are too high.

CHEMICAL TREATMENT OF LOW GRADE ROUGHAGE

Good progress was made at the Animal and Dairy Science Research Institute with the improvement of low grade roughage by treating it with concentrated caustic soda solutions. Apart



Examples of the types of rams bred and used in the Merino stud at Grootfontein

from the phenomenal improvement in production value - which more than doubled - produced by such treatments, several practical and economic problems had to be solved. The cheapest application would be to store the treated feed in wet form, almost like silage. Unfortunately such feed tends to become mouldy. This problem has already been solved at the laboratory level by the addition by cheap fungicides. The process is now being tested at the practical level by storing treated wheat and maize straw in tower silos. The possibility that chemically treated feeds could have an adverse effect on animals has been carefully investigated. So far no adverse effect has been observed.

WOOL QUALITY AND WEATHERING

As a result of the practice of selecting for high quality wool, with softness of feel as a prerequisite, the wool is showing a tendency to become gradually more undercrimped and softer. Such wool has a lower resistance to matting and a higher felting ability. An inherent lack of substance in the wool on the sheep promotes deep weathering.

According to researchers from the Karoo Region this tendency is commonly observed in the South African Merino wool clip, and it impairs the quality of Merino wool as a textile fibre and causes manufacturing losses.

MANAGEMENT

Studies on the control of endoparasites in the higher rainfall area of Natal show that the following are the most important species: *Haemoncus contortus* (wireworm), followed by *Strongyloides papilasa* (bankrupt-worm). The latter is usually regarded as a winter parasite.

The inclusion of sheep with other branches of farming is being investigated in a management trial at Langgewens, and the proportion of sheep to cattle is being studied in a grazing trial at the Nortier Experimental Farm. A study on the effect of the feeding level during late pregnancy on the mortality and growth rate of South African Mutton Merino lambs is being undertaken at Elsenburg.

BREEDING

In the Merino stud at the Grootfontein College of Agriculture the lambing and weaning percentages were 146 and 139 respectively over the past year.

Results of the two-way selection trial for the characters of wool quality and wool oil which has been conducted with Merino sheep in the Karoo Region since 1962 indicate a negative correlation between wool quality and wool oil.

It was found that in Karakul sheep selection for improvement in pattern is accompanied by a decrease in hair length.



REPRODUCTION

In the SWA Region extensive studies on hormone treatment of Karakuls aimed at a controlled increase in production show that multiple births, if restricted to twin lambs, are undoubtedly an economic proposition.

This is possible in practice if ewes are synchronised out of season (October - November) with the aid of hormone sponges and treated with pregnant mare serum (PMS) at a dose of 300 IU one or two days before the sponges are withdrawn. In general it appears that repeated treatment with progestogen and PMS results in the ewes developing a resistance to the gonadotrophin and that both the ovulation rate and the morphology of the uterus (as a result of repeated lambing and multiple births) are affected. This has been confirmed by the occurrence of abnormalities such as cystic ovaries and blocked oviducts.

In general it appears that an accelerated reproduction programme is possible but it is recommended that ewes are treated with 40 mg sponges only during late anoestrus (October/November) for 13 to 15 days and PMS is administered intravenously at a dose of 300 IU one to two days before the sponges are withdrawn.

In the traditional large lamb areas of SWA it was established that Karakul ewes can be successfully treated during late pregnancy with a corticosteroid such as flumethazone or with oestrogen. Ewes treated with stilbestrol (3 ml administered intravenously at 140 days of pregnancy) lambed significantly earlier than the group treated with flumethazone (2 ml at 140 days). The stilbestrol group did, however, show a tendency to birth problems as a result of incomplete dilation of the cervix.

In an experiment at the Animal and Dairy Science Research Institute aimed at developing a

suitable diluent for freezing ram semen the findings were as follows:

- (a) Where lactose is used in the diluent, both the concentration of lactose and the buffer should be kept low in order to ensure the best survival rate for the sperm. Where glucose or fructose is used, their concentration in the diluent is not very critical.
- (b) Relatively low concentrations of glycerol (3 - 7%) provided adequate protection against cold shock and freezing damage to sperm.

In reproduction studies in the Free State Region with S.A. Mutton Merinos the administration of 300 IU of PMS raised the conception rate of ewes by 15 per cent during the March covering season. The highest percentage of live births was attained with this treatment. The mortality percentage was also the lowest. Raising the dose of PMS to 600 IU caused a 15 per cent drop in twin births, and the mortality increased by almost 9 per cent. During the November covering season the administration of 600 IU of PMS produced the highest percentage conception, births and fecundity. It was found that the uteruses of non-lactating ewes recovered more rapidly after birth than those of lactating ewes.

BODY COMPOSITION AND EFFICIENCY OF FEED UTILISATION

In a trial at the Animal and Dairy Science Research Institute with growing SA Mutton Merino and Karakul lambs it was established that differences among lambs in feed conversion are determined almost exclusively by differences in body composition and differences in voluntary feed intake.

The most important component here appears to be the fat component - the more fat the lamb had at a particular stage the less efficient he was. Fat as such also determines the rate of voluntary

feed intake - the more fat present at a particular stage the lower the rate of intake, which is reflected in turn in the gross efficiency. Because all the Karakul lambs had more fat in their bodies than SA Mutton Merinos, they were less efficient throughout.

GOATS AND MOHAIR

PRODUCTION

As a result of the relatively dry conditions in the Karoo Region during the second half of 1975, only 1 837 000 kg of mohair was marketed. The average price of mohair rose from 217,4 c/kg for 1974 to 519,2 c/kg in 1975. During the 1976 summer season prices rose to 666 c/kg. The total income for the 1976 summer season was estimated at R13 400 000.

REPRODUCTION

Studies of the abortion problem in Angora goats in the Karoo Region show that the availability of oestrogen precursors in the blood stream of the foetus results in an increase in the synthesis of oestrogens by the placenta. The latter leads to abortion. In the course of another investigation it was established that high oestrogen levels in pregnant goat ewes are not the result of a slow metabolic clearance rate.

Feeding plays an important role in abortion. When the feeding level drops to below the maintenance level the blood glucose concentration of the ewes drops by about 30 per cent. This reaction by the ewes to nutritional stress is probably the primary stimulus for the hormonal changes that lead to abortion.

PRODUCTION POTENTIAL OF BOER GOATS

At the Dohne Research Station the practice of weaning Boer goats at 60 days, followed by finishing in the feedlot, was investigated. The average birth mass of the lambs was 3,1 kg and the average growth rate up to 120 days only 132 g per day. The mass at 120 days varied from 10,4 to 23,6 kg. The size of this variation points to a possibility of improvement through selection.

MILK GOATS FOR FEEDING TRIALS

A small foundation herd of milk goats was started at the Animal and Dairy Science Research Institute at Irene so that highly productive milk goats could be available for feeding trials at all times. The milk goat is regarded as an ideal model for the milk cow in basic digestion studies because milk goats are easy to handle and the experimental costs are far lower than with milk cows.



Researchers at an automatic feeder for pigs in the pig testing station at Elsenburg

PIGS

PIG TESTING

Pig recording and health scheme

The scheme has 47 members. According to the records of the Pig Breeders' Society these 47 herds are responsible for about 70 per cent of the total annual registrations. In all 2 367 Landrace and 582 Large White litters were recorded - a total of 2 949 litters.

Boar performance and progeny testing

Table 6 on the next page is a summary of the average test results for boars born from January 1975 to 31 December 1975.

RESEARCH PROJECTS

Stunning techniques and meat quality

As a result of a survey of various abattoirs and bacon factories in the Republic, experiments were carried out to determine whether slaughtering techniques have any detrimental effect on meat quality.

The experiments showed that incorrect electrical stunning techniques and delays in the process of evisceration can cause an increase in the incidence of PSE. (Pale, soft, exudative syndrome), but not to the same extent as the rough handling of pigs prior to slaughter or the use of the humane killer, as previous experiments show.

TABLE 6 - Average performance of boars

SA Landrace Centre	Number	Final age (days)	ADG (kg)	FCR	C.+ K.(mm)	% disqualified leg weakness
Cedara	121	146,3	0,84	3,19	41,2	63,9
Elsenburg	140	149,5	0,84	3,01	33,9	47,0
Irene	238	147,1	0,84	2,88	39,7	44,3
RSA	499	147,3	0,84	2,99	38,5	49,8
Large Whites						
Cedara	34	134,6	0,93	2,85	41,1	32,4
Elsenburg	30	140,1	0,88	2,51	37,2	33,3
Irene	101	143,8	0,87	2,70	37,3	38,7
RSA	165	140,2	0,89	2,69	38,1	36,4

Grand total: 664 boars
ADG = Average daily gain
FCR = Feed conversion ratio

Number of progeny groups tested	SA Landrace	Large Whites
Cedara	15	6
Elsenburg	36	5
Irene	29	24
Total	80	35

Age of weaning

An investigation is being carried out on the effect of weaning at 3 weeks versus weaning at 5 weeks on the reproductive performance of the sow, to determine whether the number of piglets produced per sow per year can be increased by earlier weaning.

The results of four consecutive farrowings indicate that the age at weaning had no influence on litter size.

With weaning at 3 weeks the number of litters per sow per year is increased from 2,31 to 2,54. The number of piglets reared per annum increases from 18,6 with weaning at 5 weeks to 22,5 with weaning at 3 weeks. More work has to be done in this regard, but so far prospects appear to be good.

Amino acid research

A new Small Animal Research Unit, incorporating amino acid research laboratories, is operating at the Animal and Dairy Science Research Insitute. The biological value of protein sources can now be determined by using small animals. The variation in the quality of fish meal is being studied in depth.

In conjunction with the Crops and Pastures Institute attention is being given to the protein content of certain sunflower cultivars.

POULTRY

Owing to the steady rise in egg production costs, chiefly the result of the rising feed prices, more and more egg producers are finding it impossible to make a living from egg production. To make better use of capital expenditure, large numbers of producers are starting to house three hens in two cages or even two hens in each cage. Egg producers who have already paid off the cost of their housing find the enterprise profitable, but where capital still has to be paid off the profit is

very low. This situation means that not only do established big producers take over the smaller producers but feed firms which are dependent on the smaller producers for the sale of their feed also take over some of the smaller producers to ensure a market for their feed.

During the year under review there were also cases of egg packers switching to egg production by taking over the enterprises of egg producers.

During the year under review there was a big surplus of eggs, which had to be exported at a loss. The surplus represents about 8 per cent of production.

The increased production is not a direct consequence of an increase in the number of laying hens, but is due rather to the higher productivity of the hens used, and the fact that laying hens are often replaced before their production has dropped too low.

As a result of the expansion of the larger farms, and a consequent increase in the number of day-old pullets required per farm, a drop in the number of smaller hatcheries can be expected. There is also a tendency for the big egg production units to start their own hatcheries so that they are independent of the established hatcheries.

During the year under review permission was given for breeding material for the production of table eggs to be imported from abroad. The larger egg producers will make use of this privilege so that new breeding material will shortly be available.

Poultry meat, especially broilers, has already become the second largest source of meat in the Republic. This product is still gaining ground steadily.

During the year under review two firms made use of the quarantine facilities to import broiler breeding material, and one firm imported duck breeding material from the United Kingdom.

6 674 dozen fertilised eggs from the various broiler breeding strains imported have already been distributed to dealers.

Random sampling tests for both egg and meat production were started at Glen and Irene during the year under review. There were 59 participants in the egg production section and 18 in the meat production section in the two tests combined.

The Irene random sampling egg production test was open to private entries from abroad for the

first time. In the test in progress at present breeding material from seven overseas breeders is being compared with breeding material from local breeders. To fit in with commercial development the random test was so organised that a comparison can be drawn between three hens per 450 mm cage and one hen per 225 mm cage.

Owing to the rise in feed costs and the accompanying shrinkage in profits from the production of eggs and poultry meat, special attention is being given to the development of cheaper poultry feeds. The aim of the programme is to identify the absolute minimum requirements and consequently develop rations which will not necessarily result in maximum production, but will produce optimum economic production.

Fish meal remains the most important source of protein in poultry feeding, but in view of the increasing scarcity of this feed trials have been started to determine the minimum quantity of fish meal for adding to fowl rations.

The effect of two types of fish meal that differ in quality on the growth of broilers was determined. It is apparent from the results that at 6 weeks of age the good quality fish meal produced a significantly better average body mass than the poor fish meal ration. The addition of lysine to the poor fish meal made no difference to the average body mass. At 8 weeks the addition of lysine to the

poor fish meal ration even retarded the growth of chicks in comparison with growth on the good fish meal ration.

A control trial was carried out to evaluate the ration fed to hens in the random sampling test in comparison with three commercial rations. With regard to the number of eggs, two commercial rations produced better results than the trial ration, but the trial ration and one commercial ration showed the best feed conversion.

DUCKS

In a trial where Pekin ducks were bred according to the Hagedoorn system, the fertilisation percentage rose to 84,2 and the hatchability to 69,6 per cent - a 30 per cent improvement on the previous season.

After four years of breeding a pure white dwarf duck was successfully produced. The average adult weight of the dwarf duck is 1800 g, as against 3250 g for the Pekin duck. The dwarf duck produced a 75,6 per cent egg production in August, as against 63,3 per cent from the Pekin ducks.

The development of a breed for the production of broiler ducks has therefore been successful.

7. VETERINARY SERVICES

INTRODUCTION

During the year under review there was only one outbreak of **foot-and-mouth disease** in Caprivi, for which the SAT II strain of the virus was responsible. All cattle were immediately inoculated with an inactivated bivalent SAT I and SAT II vaccine and no further cases were found.

Although there were no outbreaks in the Republic, clinically suspected cases were found among the game in the Kruger National Park. Routine precautionary measures to protect the cattle-farming areas against foot-and-mouth disease continued to be enforced.

The first case of **rabies** in Natal since 1973 was diagnosed in a cat in the Eshowe district. The compulsory routine immunisation of dogs in proclaimed rabies areas, of which Natal is one, was continued. After an outbreak cats are voluntarily immunised.

Progress with the **bovine tuberculosis** eradication scheme was better than last year but was still far from satisfactory. During the year the first courses to train senior members of the inspectorate staff to do tuberculin tests were held, and 42 officers were trained. The number of tuberculin tests carried out during the year under review was 723 909, compared with 657 345 during the previous year, and 2 510 certificates were issued to bovine tuberculosis-free herds, in comparison with 2 287 during the previous year.

Sheep scab remained a serious problem in the Republic and both the number of outbreaks and the number of magisterial districts affected increased. Altogether there were 362 outbreaks in 74 magisterial districts, including 83 outbreaks in the homelands in 6 magisterial districts. The task of the Division of Veterinary Services in controlling this disease is made considerably more difficult by the ignorance and poor co-operation of some farmers and speculators. In all 1 461 505 head of small stock on infected and contact farms were dipped at least twice at an 8 to 10 day interval in an approved dip under official supervision.

There were two outbreaks of **African swine fever** during the year but these were swiftly and effectively controlled. The disease did not spread to other farms. Both outbreaks were in declared swine fever areas. Six pigs were destroyed during the outbreak in the Potgietersrus district and 110 pigs in Lebowa.

The services rendered by the regional veterinary laboratories are increasing continually. A

total of 1 347 sheath washings from bulls were investigated in the laboratories for venereal diseases. The important and expanding extension service rendered, principally by these laboratories, is increasing the farmers' awareness of the availability and value of these services.

Climatic conditions and the abundant rains during the past year again favoured the breeding of insects, particularly mosquitoes, and consequently diseases such as Rift Valley fever and bluetongue were responsible for severe losses in young lambs. Studies by the Veterinary Research Institute on the virus strains which accounted for the occurrence of bluetongue revealed that in most cases strains which are not represented in the vaccine were responsible for the problem. Progress is being made, however, with the attenuation of these strains with a view to including them in the vaccine.

Although considerable losses from **Rift Valley fever** occurred in unvaccinated animals, losses in inoculated herds were confined mainly to very young lambs. These losses may be ascribed partly to the enormous numbers of infective mosquitoes which attack new-born lambs before colostral immunity has reached a protective level.

Last year the plague of mosquitoes was attributable mainly to *Culex* species which breed in open waters and were effectively controlled by a predatory fly, but this year *Aedes* species predominated. After rain *Aedes* species breed in moist areas around pans and are therefore not easily controlled by natural enemies. Research to find an effective pesticide for the control of these mosquitoes had consequently to be undertaken from scratch, and to date one very effective preparation with a long-lasting residual effect has been found for treating the breeding places.

Not only has a further improvement been made to the redwater vaccine, but it has also been discovered that redwater can be transmitted by another tick species, viz *Hyalomma rufipes*. Research on the resistance of ticks to dips has shown that a high level of resistance by practically all species of ticks to certain dips is limited to a few places in definite areas in the Cape, the Transvaal and Natal, but that a lower level of resistance seems fairly widespread.

The investigation into the causes of abortion in cattle and sheep and losses among newborn and young lambs and calves was continued. *Chlamydiosis* (the cause of enzootic abortion in sheep), which occurs either in isolation or together with other infections, such as brucellosis, vibriosis

and Rift Valley fever, was apparently the most important cause of abortion in cows and death or retarded growth in lambs. It has been confirmed for the first time in South Africa that *toxoplasmosis* is a cause of abortion in sheep.

This year has shown a slight increase in the total quantity of vaccine issued by the Institute. Nevertheless, almost 171 million doses of 42 different vaccines were issued during the year. One new vaccine, that against infectious bovine rhinotracheitis, was released during the year for use in feedlots, and as a result of continued research, further improvements were effected in the vaccine against infectious coryza in poultry by the introduction of a second strain of the causative organism. The comprehensive research to improve the horsesickness vaccine is now almost complete. Safe and effective strains of the eight types of virus occurring in South Africa have been selected by means of a sophisticated technique and within the foreseeable future the Institute will start with the production of a new vaccine based on the injection of four vaccines, consisting of two strains each, at intervals of 3 weeks. Since this improved vaccine need be administered only once in a lifetime, it will be a great boon to the farmer.

NOTIFIABLE DISEASES

FOOT-AND-MOUTH DISEASE

During the year there was only one outbreak and that was in Caprivi.

The SAT II strain of the virus was isolated from samples collected from cattle during October 1975. Thereafter all cattle were inoculated with an inactivated bivalent SAT I and SAT II vaccine, and no further cases were found.

Clinically suspected cases were also found among the game in the Kruger National Park but were such that samples could not be collected. These cases occurred among buffalo in the northern and central regions of the Park and among impala in the southern region.

The routine precautionary measures to protect stockfarming areas against foot-and-mouth disease include regular inspections at short intervals of the stock in the areas adjoining the Kruger National Park and those along the international borders with Botswana, Rhodesia and Mozambique. There are regular patrols and maintenance of the fences on these borders and round the Kruger National Park.

During these patrols 21 cattle, 3 sheep and 24 goats were found which had been illegally brought into or had strayed into the country.

As a precautionary measure 415 170 cattle and 67 829 head of small stock were immunised in the stock-farming areas adjacent to the Kruger National Park with an inactivated bivalent SAT I and SAT II vaccine. A total of 45 154 cattle was immunised in Caprivi during the outbreak there.

RABIES

During the year under review, 262 (26 per cent) of the 998 specimens examined for rabies by

the Veterinary Research Institute were positive, compared with 222 (23 per cent) the previous year. Two hundred and seven of the positive specimens were from the Republic of South Africa, 46 from South-West Africa and the rest from Botswana and Swaziland. The incidence of the disease in different hosts was as follows:

Cattle	83
Yellow mongooses	49
Dogs	48
Jackals	15
Domestic cats	13
Species of wild cats	19
Other wild carnivores	24
Other types of farm animals	8
Humans	3

The first case of rabies in Natal since 1973 was diagnosed in a cat in the Eshowe district. There were also two cases in Caprivi.

The rabies unit is continuing to assist Venda and Gazankulu with the immunisation of dogs against this disease. Phostoxin tablets were again supplied to control the meercats on farms where there was an outbreak.

As in the past, dogs in the proclaimed rabies areas of Natal and parts of the Northern and Eastern Transvaal were immunised against rabies this year. All dogs and cats within a radius of 15 to 25 kilometres of confirmed cases were vaccinated, as in the past. During the year 99 173 dogs and 8 485 cats in White areas and 93 889 dogs in the homelands were immunised by officers of the Division of Veterinary Services or the various homelands.

ANTHRAX

There were two outbreaks of anthrax in the Republic this year during which 34 cattle died. In all 3 649 279 cattle and 5 245 head of small stock were immunised in the European areas by or under the supervision of officers of the Division of Veterinary Services, either during the outbreaks or as a preventive measure. The corresponding figures for the homelands are 2 274 602 cattle and 12 head of small stock.

In the Kruger National Park there were 17 cases (7 impala, 4 zebra, 2 roan antelope, 2 kudu and 2 hippopotami).

EAST COAST FEVER AND RELATED DISEASES

East Coast fever (*Theileria parva*) - There have been no cases in the Republic since 1954. The obligatory taking of spleen smears from cattle that died in the scheduled areas was discontinued in the White areas during November 1975. Up to that time 41 099 smears had been examined by officers of the Division of Veterinary Services. In the homelands with scheduled areas, 211 470 such smears were examined.

Corridor disease (*T. lawrencei*) - There were outbreaks of this disease in kwaZulu (four) and

Barberton (one) on farms bordering on or adjacent to the Umfolozi and/or Hluhluwe Game Reserves and the Kruger National Park. Restrictions on the movement of stock, a more intensive dipping programme and the administration of antibiotics were applied as control measures.

Benign bovine theileriosis (*T. mutans*) - Seventeen cases of the disease, five in the Eastern Transvaal Region and twelve in kwaZulu, were diagnosed during the year.

Preliminary results of research at the Veterinary Research Institute suggest that the bont tick (*Amblyomma hebraeum*) is an excellent vector of *Theileria mutans*, but all attempts to transmit the same strain of the parasite by means of the brown tick (*Rhipicephalus appendiculatus*), until now regarded as the most important vector, were unsuccessful.

TUBERCULOSIS

During the year under review 4 063 herds took part in the bovine tuberculosis eradication scheme and 2 510 certificates were issued to tuberculosis-free herds in comparison with 3 631 herds and 2 287 certificates last year.

In all 3 742 positive reactors were slaughtered during the financial year ended 31 March 1975. R777 887 was paid as compensation to the owners of these cattle. Carcases which were not condemned for human consumption were sold for R395 941 and the amount paid into Miscellaneous Revenue.

Contracted private veterinarians were paid an amount of R295 130 in terms of the scheme (1974/75 R253 523) for tests and services rendered on behalf of the State. A further R21 863 (1974/75 R26 500) for INH (isoniazid), eartags and costs not covered by the income when positive reactors were slaughtered brought the total outlay with regard to the scheme to R1 094 881 (1974/75 R572 252).

There were 303 private veterinarians involved in the scheme at the end of the year under review.

Since the scheme was initiated on 14 May 1969, 523 previously infected herds have qualified for tuberculosis-free certificates. Of these, 95 were accredited during the year under review. Forty-nine heavily infected herds have been treated with INH since the scheme was started.

The table at the bottom of the page is a summary of the tests done during the year under review. Figures for the previous year are given in brackets.

The percentage of reactors, with the exception of tests on accredited herds, was 1,93 per cent positive and 0,82 per cent suspected.

During the year a start was made with the training of senior members of the stock

inspectorate staff to enable them to do tuberculin tests and 42 officers were trained during two courses.

In the various homelands 4 501 cattle were tuberculin-tested. Of these 16 reacted positively and 46 were suspected.

BRUCELLOSIS

In accordance with the brucellosis eradication scheme 587 135 heifers, 3 to 11 months of age, were inoculated in the European areas by or under the supervision of officers of the Division of Veterinary Services. Similarly 154 411 heifers were immunised in the Homelands.

In cases where infection was diagnosed and the State veterinarian gave written permission for animals older than 11 months to be inoculated, 1 712 females were immunised in White areas by or under the supervision of officers of the Division of Veterinary Services. Forty-one such animals were injected by officers in Bophuthatswana.

It is intended to initiate a voluntary accreditation scheme for brucellosis during the coming year. Brucellosis-free certificates will be issued to the owners of herds that attain accredited status.

The following serological tests for brucellosis were done at State veterinary offices and regional veterinary laboratories:

Type of animal	Number of tests	Result	
		Positive	Suspected
Cattle	50 082	4 859(9,7%)	1 007(2,0%)
Small stock	3 867	453(11,5%)	87(2,3%)

31 418 serological samples from cattle were examined at the Veterinary Research Institute. Of these 11 per cent were positive. *Brucella abortus* was isolated from 64 per cent of 565 cattle fetuses examined there. The organism was also isolated from 13 out of 48 fetuses examined by the regional veterinary laboratory at Stellenbosch.

TRYPANOSOMIASIS

(i) NAGANA

No cases of nagana were diagnosed in the Republic of South Africa.

There were a few cases of the disease in Caprivi, along the Kwando River. The tsetse fly penetrates this area of the Caprivi from Northern Botswana and from islands in the Kwando River. Because of the difficulty of keeping accurate records in the Caprivi, it is not possible to give the exact number of cases of nagana in the area, but

Test	Number of herd tests	Number of tuberculin tests	Reactions	
			Positive	Suspected
Accreditation	3 108(2 779)	461 041(403 279)	-	411(206)
Interim	812(1 066)	79 243(119 974)	-	152(340)
Diagnostic	358(420)	16 069(26 329)	-	77(46)
Import	90(79)	1 183(827)	-	-(-)
Export	108(169)	6 206(4 893)	-	1(8)
INH	49(30)	9 817(9 642)	985(486)	215(92)
Infected	682(425)	150 350(92 401)	4 246(1 457)	1 360(268)
Total	5 207(4 968)	723 909(657 345)	5 231(1 943)	2 216(960)

the number of cases treated annually appears to be fairly constant. Because of the continual penetration of flies from these areas, it is not possible to eradicate the disease completely. However, thanks to annual spraying by the Division of Veterinary Services the status quo is being maintained.

This campaign was carried out from mid-July 1975 to mid-October 1975. Because of other priorities Botswana was again unable to contribute to the spraying in the Caprivi tsetse fly complex. Angola was also unable to participate because of political considerations.

As in the previous year, an area of about 800 km² was sprayed with 8 000 litres of dieldrin concentrate as a 3,1 per cent emulsion in water. However, owing mainly to escalating costs of insecticide, but also to higher transport and labour costs, the total cost of the 1975 operation was R26 720 as against R19 180 for the 1974 operation.

The joint spraying campaign carried out in Mozambique in previous years by Rhodesia, Mozambique and South Africa was not possible during the year under review, mainly because of political and security reasons.

The Interterritorial Committee for Tsetse Fly Control did not meet this year, chiefly as a result of the political changes in Angola and Mozambique.

(ii) DOURINE

The Veterinary Research Institute has found that it will not be possible to eradicate dourine with the experimental drug MsBe, since this particular preparation does not sterilise the infection in long-established cases. This treatment may, however, be of value shortly after a potentially infective service seeing that treatment within one month of infection will sterilise the infection in the majority of cases.

Of the 1 560 serum samples submitted to Onderstepoort during the year for examination for dourine, 59 (3,1 per cent) proved positive, their distribution being as follows: Transvaal 9, the Cape 5, the OFS 20, Natal 10, Lesotho 2, Botswana 1 and SWA 12.

LUMPY SKIN DISEASE

Sporadic outbreaks occurred throughout the Republic. At the Veterinary Research Institute the Allerton virus was isolated from 9 outbreaks. No Neethling virus was isolated although it is possible that outbreaks in the Winter Rainfall Region and in the Rustenburg, Kuruman and Barberton State veterinary areas could have been caused by it. Officers of the Division of Veterinary Services immunised 31 022 cattle against the disease during the year under review.

SHEEP SCAB

The occurrence of this disease has once again reached serious proportions and there were outbreaks in all regions of the Division and also in Lebowa, Bophuthatswana and kwaZulu. In all

there were 362 outbreaks in 74 magisterial districts during the year. Of these 83 occurred in 6 magisterial districts in the homelands. The affected magisterial districts with the number of outbreaks in each are as follows:

Seshego (48), Gordonias (25), Nqutu (20), Boshof (14), Kenhardt and Vryburg (13 each), Postmasburg and Kuruman (11 each), Calvinia, Piet Retief, Potchefstroom and Vereeniging (10 each), Belfast (9), Brakpan (8), Nkandla and Bloemfontein (7 each), Wodehouse, Krugersdorp and Brandfort (6 each), Ventersdorp, Pretoria, Aliwal North and De Aar (5 each), Utrecht, Roodepoort, Vanderbijlpark and Bochum (4 each), Nigel, Newcastle, Winburg, Coligny, Welkom, Theunissen, Bultfontein, Vryheid, Lions River, Benoni, Delmas and Middelburg (Cape) (3 each), Hopetown, Fraserburg, Steynsburg, Germiston, Middelburg (Tvl), Herbert, Koffiefontein, Senekal, Lichtenburg, Randfontein and Westonaria (2 each), Namaqualand, Malmesbury, Prieska, Wakkerstroom, Bethal, Carolina, Boksburg, Heidelberg, Johannesburg, Bronkhorstspuit, Thabazimbi, Standerton, Mooi River, Pinetown, Babanango, Fauresmith, Hartswater, Ladybrand, Mafeking, Kroonstad, Ventersburg, Virginia, Soutpansberg and Tlhaping Tlharo (1 each).

Speculators and stock sales were again mainly responsible for the spread of this disease. Various cases of repeated outbreaks also occurred. In a number of these cases it appeared that there were problems with the dip, although dipping was carried out according to instructions. Experiments carried out in the field by officers of the Veterinary Research Institute in this connection showed, *inter alia*, that certain formulations of diazinon are affected by the hardness of the water and therefore the effectiveness of dipping is reduced. Another formulation of the diazinon is now available which gives good results in hard water.

In all 1 461 505 head of small stock on infected and contact farms in the Republic were dipped at least twice at an 8 to 10 day interval, under official supervision and in an approved dip.

MANGE

Sporadic cases occurred among cattle, horses and goats in all the regions, especially in the winter months. Serious problems were again encountered among goats in kwaZulu. Pig mange was widespread in the Northern and Eastern Transvaal Region as well as in the Winter Rainfall Region.

Problems were experienced in the Winter Rainfall Region when diazinon was used as a dip to control the condition.

SWINE FEVER

Classical swine fever does not occur in the Republic.

There were two outbreaks of African swine fever during the year under review. During the outbreak in the Potgietersrus district 6 pigs were destroyed and R115 was paid to the farmer in compensation. In Lebowa 110 pigs were destroyed



Mange-mites are being collected from an infested sheep

during the outbreak there and the owners were compensated.

There was no spread of the infection after the infected and contact pigs had been destroyed, the styes thoroughly disinfected and movements to and from the infected farms controlled.

In the scheduled swine fever areas the same control measures as before were applied. In the White areas there were 572 approved piggeries and 24 in the Homelands.

Further research at the Veterinary Research Institute on the propagation of the swine fever virus in conventional tissue cultures has established that a monkey kidney cell-line can be used for the confirmation of the diagnosis in acute and subacute cases. The cultures are also useful for indicating the presence of non-haemadsorbing strains of the virus, since the cytopathogenic changes which such strains cause can be distinguished from those of the haemadsorbing strains.

On a farm in the Pietersburg district a strain of the non-haemadsorbing swine fever virus with low virulence was isolated from the last pig of a herd which had succumbed to the disease over a period. The strain apparently has a low virulence for pigs and there is a real danger that infected pigs will recover naturally and act as vectors of the virus.

SWINE ERYSIPELAS

During the year 28 outbreaks of this disease were reported in the Republic, 19 of which occurred in Natal.

The morbidity and mortality was low during the outbreaks and improved hygiene together with the administration of antibiotics controlled the outbreaks. The Veterinary Research Institute has initiated research to produce a vaccine against this disease.

EPIZOOTIC LYMPHANGITIS

No confirmed cases occurred during the year.

JOHNE'S DISEASE

One case was diagnosed in Natal during the year. No compensation was paid.

The affected farm as well as farms where the disease had occurred previously were kept under careful observation for further developments.

INFECTIOUS LARYNGOTRACHEITIS

Only one case was diagnosed in the Winter Rainfall Region in comparison with 32 last year. The vaccine gives excellent results and there should be no further serious problems as long as farmers use the vaccine correctly.

RINDERPEST

This disease does not occur in the Republic.

NEWCASTLE DISEASE

Outbreaks occurred in all the regions of the Division of Veterinary Services, especially where the owners do not follow the recommended

inoculation programme. The disease took its toll in all the Homelands. Vaccination is compulsory in Lebowa and 99 345 head of poultry were immunised by officers of the Homeland's veterinary service. In Venda and Gazankulu 7 446 head of poultry were immunised after outbreaks.

Studies at the Veterinary Research Institute on the best means of administering mass doses of the drinking water vaccine to broilers have shown that the aerosol (spray) treatment gives much better results than the drinking water method. Three weeks after the aerosol application of vaccine to day-old, 5-day-old and 10-day-old chicks, 50 per cent, 67 per cent and 95 per cent were protected, respectively, in comparison with 17 per cent, 34 per cent and 50 per cent with the drinking-water method. The latter method is therefore not recommended by the Institute.

A total of 8 151 haemagglutination-inhibition tests for Newcastle disease to test the level of immunity attained after inoculation were done by the Veterinary Research Institute. Similar tests are also carried out by the regional veterinary laboratory at Stellenbosch.

Newcastle virus was isolated from 30 specimens out of 105 examined by the Veterinary Research Institute and 14 of the isolated samples were then subjected to virulency determinations.

BACILLARY WHITE DIARRHOEA (BWD) AND FOWL TYPHOID

During the year there were four reported outbreaks of BWD and nine of fowl typhoid in the Republic. The incidence of the diseases is on the increase and there has also been a considerable increase in the number of isolations of *Salmonella pullorum* and *S. gallinarum* from samples received by the Veterinary Research Institute from the field.

BWD occurred for the first time since 1961 in the Winter Rainfall Region.

At the Veterinary Research Institute 2 765 BWD plate agglutination tests, 17 of which were positive, were done. Seventeen samples were subjected to *Salmonella* isolation techniques.

FOWL CHOLERA

One outbreak was diagnosed in Natal.

PSITTACOSIS

At the Veterinary Research Institute 24 samples were examined, one of which was positive.

SCRAPIE

No cases were reported.

There are still a few farms that were previously infected where control measures such as regular inspections and control over movements by means of permits, are applied.

EQUINE INFECTIOUS ANAEMIA

There were no cases.

GLANDERS

No cases occurred.

CONTAGIOUS BOVINE PLEURO-PNEUMONIA

No cases occurred in the Republic.

An investigation by the Veterinary Research Institute into the decline in the viability of the organisms in the live vaccine revealed that storage at room temperature gave by far the best results. This entirely eliminates the necessity for refrigerating and freezing the vaccine while it is being transported and stored.

NON-NOTIFIABLE DISEASES

BACTERIAL DISEASES

MASTITIS

Throughout the Republic *Staphylococcus aureus* was again the major cause of mastitis problems in dairy cows during the year under review. Eighteen per cent of the isolations from mastitis milk in the Winter Rainfall Region were *S. aureus*. Other organisms which played a role in causing mastitis were *Corynebacterium*, *Streptococcus*, *Pasteurella*, *Escherichia*, *Pseudomonas*, *Klebsiella*, *Sarcona*, *Neisseria*, *Enterobacter*, *Alcaligenes* and fungi and yeasts.

Poor hygiene, inefficient management, polluted drinking water (*E. coli*) and the misuse of mastitis remedies were contributory factors to problems with mastitis.

Ticks in the homelands and the Northern and Eastern Transvaal Region caused serious problems, especially in beef cattle.

Blue udder caused by *Pasteurella* and *S. aureus* was serious among sheep in the Eastern Cape and Karoo and Free State Regions. The problem was aggravated by the exceptionally wet year and the increase in the number of ticks and blood-sucking insects. *Pasteurella* was the causal organism of blue udder among goats in the Louis Trichardt State veterinary area.

S. aureus was the pathogen in 69 per cent of the cases of mastitis in rabbits investigated by the regional veterinary laboratory at Stellenbosch.

ENTEROTOXAEMIA (PULPY KIDNEY)

Deaths due to pulpy kidney occurred where farmers failed to inoculate, where animals were moved to bush green grazing before immunity was properly developed after immunisation, or where animals were dosed before being inoculated. Few problems were encountered in the Northern and Eastern Transvaal, Transvaal, Highveld and Eastern Cape and Karoo Regions.

The oil adjuvant vaccine gives good results. However, farmers in the Free State and Winter Rainfall Regions prefer the alum-precipitated vaccine, although immunisation with this vaccine has to be repeated more frequently.

**BANTOE-TUISLANDE
BANTU HOMELANDS**

GAZANKULU
LEBOWA
VENDA
NDEBELE



KWAZULU



BOPHUTHATSWANA



QWAQWA



TRANSKEI



CISKEI



GEBIED VOORLOPIG INGELYF
BY SWAZILAND



AUGUSTUS 1975

**REPUBLIEK VAN SUID-AFRIKA
REPUBLIC OF SOUTH AFRICA**

**VEEARTSENYKANTORE
VETERINARY OFFICES**

- Direkteur Veeartsenydiens
Director Veterinary Services
- ★ Aast.-direkteur
Asst. Director
- ☆ Staatsveearts
State Veterinarian
- Veterinêre Streeklaboratorium
Regional Veterinary Laboratory
- Staatsveeartswykgrense
State Veterinary Areas Boundaries
- Streekgrense
Regional Boundaries

- 1 Winterreënstreek — Winter Rainfall Region
- 2 Oos-Kaap en Karoo — Eastern Cape and Karoo
- 3 Vrystaat — Free State
- 4 Natal — Natal
- 5 Oos-Transvaal — Eastern Transvaal
- 6 Transvaal — Transvaal
- 7 Hoëveld — Highveld

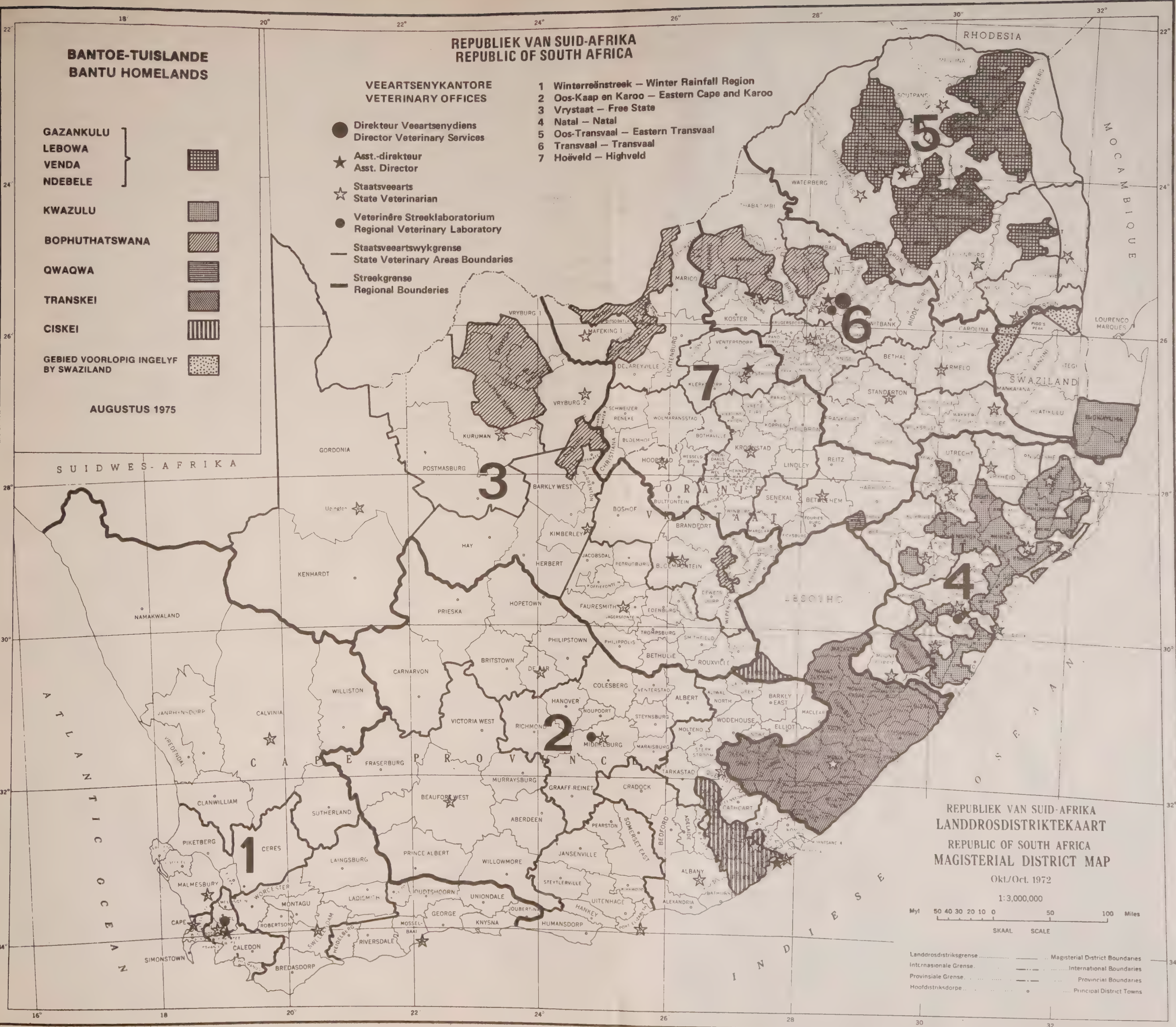
**REPUBLIEK VAN SUID-AFRIKA
LANDDROSDISTRIKTEKAART
REPUBLIC OF SOUTH AFRICA
MAGISTERIAL DISTRICT MAP**

Oktober/Oct. 1972

1:3,000,000

Myl 50 40 30 20 10 0 50 100 Miles
SKAAL SCALE

Landdrostdistriksgrense Magisterial District Boundaries
Internasionale Grense International Boundaries
Provinsiale Grense Provincial Boundaries
Hoofdistriktdorpe Principal District Towns



Officers of the veterinary services of the Homelands immunised 332 313 sheep against the disease.

BLACK-QUARTER

Sporadic cases of quarter-evil occurred over the whole Republic, except in the Transvaal Region of the Division of Veterinary Services, where there were serious outbreaks in the Pretoria State veterinary area, with up to 30 per cent losses. In the Winter Rainfall Region there were odd cases among sheep in the Swellendam State veterinary area.

In the Eastern Cape and Karoo Region deaths among sheep and goats were caused by *Clostridium chauvoei*, *Cl. septicum* and *Cl. oedematiens*. Experimental *Cl. septicum* vaccine was used with success there as well as in the Highveld Region.

In kwaZulu black-quarter was widespread. There were fewer cases than usual in Venda, Gazankulu and Lebowa. Compulsory inoculation of cattle (between 3 months and 3 years of age) was continued in the three Homelands. In Venda and Gazankulu young calves are immunised twice a year. A total of 533 285 cattle were immunised against the disease by officers in the Homelands.

BOTULISM (LAMSIEKTE)

A few cases of the disease occurred. In the Rustenburg district 29 cattle died after chewing on a kudu carcase. Deaths occurred in the Dundee district after stock had drunk polluted water. There were 22 suspected cases in the Masisi region in Venda.

The Onderstepoort vaccine still gives outstanding results and makes cattle-farming possible in areas such as the Northern Cape and the sandveld of the Potgietersrus and Burgersfort area in the Lydenburg district.

Officers immunised 10 079 cattle in Venda, Gazankulu and Lebowa.

The immunising value of an experimental oil emulsion vaccine was found to be much greater than that of the present aluminium phosphate-precipitated vaccine by the Veterinary Research Institute.

CORYNEBACTERIOSIS

During the year cases of this disease increased among cattle, sheep and goats. The good rainfall in the drier regions of the country with the consequent increase in tick numbers and *Aristida* grass species were contributory factors. Poor hygienic measures led to a serious outbreak of abscesses due to *Corynebacterium* infection among pigs in the Kuruman district.

The improvement of hygiene during castrations, tail docking and shearing reduces the disease among sheep and if the available vaccines are always correctly used problems with *Corynebacterium* can be effectively controlled.

PASTEURELLOSIS

To judge from the number of specimens received by the Veterinary Research Institute, pasteurellosis is currently the most widespread fatal bacterial disease of animals. *Pasteurella multocida* was responsible for 53 of the outbreaks investigated and *P. haemolytica* for 38, the animals mainly involved being sheep, rabbits and cattle.

Inadequate shelter against wind and weather caused *Pasteurella* problems in feedlots, calf pens and piggeries in the Winter Rainfall Region. After the torrential rains thousands of lambs in the South-Western Free State and North-Western Cape died of a disease syndrome in which *Pasteurella*, *Chlamydia* and other organisms played a role.

In the Northern Transvaal on a farm beyond the Soutpansberg 100 out of 400 goats died from pasteurellosis within two months. The incidence of the disease is increasing in the Standerton State veterinary area.

The organism was also an important causal organism of blue udder in sheep in the following regions of the Division of Veterinary Services: Free State, Winter Rainfall and Eastern Cape and Karoo.

The use of the Onderstepoort vaccine has the desired effect.

TETANUS (LOCKJAW)

Once again only isolated cases of lockjaw were reported. Lambs were involved in all cases except one. In all these cases the elastrator had been used to dock or to castrate the lambs.

An outbreak among horses was reported from the Calvinia State veterinary area.

Some farmers in the Free State Region of the Division of Veterinary Services still neglect to protect their pregnant ewes by preventive inoculation and therefore suffer unnecessary losses, since the Onderstepoort vaccine gives good results.

COLIBACILLOSIS

Deaths among calves, lambs, piglets and poultry caused by *Escherichia coli* again occurred in all the regions. This organism, together with *Chlamydia*, *Pasteurella* and *Salmonella*, was responsible for virtually a 100 per cent mortality of calves on a dairy farm in the Winter Rainfall Region. The Regional veterinary laboratory at Stellenbosch succeeded in reducing the mortality to three per cent by doing the necessary extension work.

The disease can be eradicated among pigs and cattle if the vaccine is used systematically together with improved management and hygiene.

The irresponsible use of antibiotics has resulted in a resistance to them developing in many cases and inoculation is the only effective control measure.

Two pathogenic serotypes, which are well known overseas, were recently isolated in South Africa for the first time by the Veterinary Research

Institute. One of the strains is the most important cause of oedema in pigs.

The Veterinary Research Institute has determined that there has been an increase in the number of cases of colisepticaemia among broilers. A possible contributory factor is the use of live virus vaccines for the immunisation of broilers. A total of 424 bacterial isolations and 69 antibiograms were done by the poultry section of the Veterinary Research Institute in this connection.

LEPTOSPIROSIS

A few cases occurred among pigs in the Kimberley and Vryburg State veterinary areas. No cases were reported from the rest of the Republic. Antibiotics and the use of the available vaccine controlled the outbreaks.

VIBRIONIC DYSENTERY OF PIGS

One case each was diagnosed in the Barberton and Bloemfontein State veterinary areas. The disease was diagnosed on eight farms in the Winter Rainfall Region and a number of cases in Natal were confirmed by the regional veterinary laboratory at Allerton.

PSEUDOMONAS INFECTION

Pseudomonas infection was confirmed as the cause of mastitis in the following Regions: Natal, Winter Rainfall and Highveld. The regional veterinary laboratory at Stellenbosch isolated the organism from 74 samples. In the Fauresmith State veterinary area the organism caused subcutaneous abscesses in lambs. Discoloration of wool as a result of this organism again occurred in the Eastern Cape and Karoo Region.

ACTINOBACILLOSIS AND ACTINOMYCOSIS

A few cases occurred in all the regions except the Winter Rainfall and Transvaal Regions.

FOOT-ROT AND FOOT ABSCESS

These diseases occurred in all the regions, mainly as a result of the wet conditions and protracted rains. Sheep were particularly badly affected in the Free State Region. In some flocks up to 60 per cent of the animals were affected and the wet conditions hampered treatment, with the result that thousands of sheep died and thousands were left with permanent damage to their feet. These conditions caused terrific production losses. In the Transvaal Region problems were encountered with the treatment of the condition in cattle: Certain drugs which had controlled the condition effectively in the past no longer did so.

The survey of this disease which was begun last year by the Veterinary Research Institute has shown that almost every case of foot-rot and foot abscess in sheep is caused by a mixed infection of *Fusibacterium necrophorum* and *Corynebacterium pyogenes*. Again no trace could be found of

Bacteroides nodosus - the usual cause of foot-rot in sheep in other countries.

STRANGLES

A single case occurred in the Lions River district.

"REDGUT"

This condition is causing increasing problems among sheep, especially in the Winter Rainfall Region. Thirty-nine cases were investigated by the regional veterinary laboratory at Stellenbosch and *Clostridium perfringens* was isolated in 25 cases. The role of this organism in the pathogenesis of the disease is, however, still not clear.

LISTERIOSIS

A *Listeria*, which was isolated from a goat at the regional veterinary laboratory at Stellenbosch, was identified as *L. monocytogenes* Type 1. This is the first confirmed case of listeriosis in a ruminant in South Africa.

During the outbreak eight out of 70 goats died.

PROTOZOAL DISEASES

BABESIOSIS (REDWATER)

Redwater again caused serious problems during the year under review. In the Winter Rainfall Region the increase in the number of outbreaks is alarming, especially in State veterinary areas of Calvinia and Stellenbosch. In the Eastern Cape and Karoo Region the disease normally occurs in the coastal areas but during the year under review it caused problems in the Karoo area as well. Both *Babesia bigemina* and *Babesia bovis* caused cases.

Redwater is also increasing in the Free State Region, except in the Upington State veterinary area. *B. bovis* was responsible for most of the cases in the Lydenburg and Barberton State veterinary areas. Redwater also caused serious problems in the Standerton and Piet Retief State veterinary areas.

The only Homeland in which there were serious problems was kwaZulu, after various dipping tanks overflowed because of torrential rains and the resultant interruption of the dipping of the cattle.

Studies on the life cycle of the redwater parasites in their tick hosts were continued at the Veterinary Research Institute. Attempts to transmit *Babesia bovis* by means of *Boophilus decoloratus* again proved unsuccessful. Furthermore, the fact that no dividing forms of the redwater parasite could be demonstrated in the ticks was a further indication that they probably do not act as vectors of the parasite. However, a new vector was discovered, namely *Hyalomma rufipes*, one of the bont-legged ticks, but the redwater parasite involved has not yet been identified with any certainty.



Babesia bigemina, the cause of redwater in cattle, occurs in red blood cells and looks like this under the electron microscope

Further field experiments with the improved redwater vaccine have shown that *B. bovis* reactions can be effectively controlled by block treatment with diminazene 7 days after mass immunisation. The successful freezing of infective forms of *B. bigemina* from ticks has made it possible to stabilise the virulence of this constituent of the vaccine.

Two attempts to reproduce in the laboratory the alleged influence of brown tick toxicosis on redwater failed, despite the fact that up to 60 000 adult ticks were used for this purpose. The ticks were unable to cause either a relapse in a carrier animal or to complicate a benign primary reaction.

Biliary fever in dogs occurred in all regions and was particularly severe in the Transvaal and Free State Regions. In the latter region the disease among the dogs of the South African Police was complicated by the presence of *Ehrlichiosis*, which made treatment more difficult.

Few cases were reported among cats, however.

Studies on the chemotherapy of *B. felis* infection at the Veterinary Research Institute indicated that the preparations commonly used, such as tetracyclines, trypan blue, cephaloridine and imidocarb, had virtually no effect on the parasitaemia or the disease. On the other hand, a single dose of 0,5 mg/kg of primaquin phosphate (a

malaria drug) **per os** produced a dramatic effect on both manifestations. However, relapses requiring further treatment did occur. The drug is toxic at double the therapeutic dose and should be handled with discretion.

Isolated cases of **biliary fever** in horses were diagnosed; in the Free State Region, however, a lot of cases were diagnosed.

ANAPLASMOSIS (GALLSICKNESS)

There was a higher incidence of the disease in all the regions as a result of the increase in tick numbers. Serious losses occurred in the Free State Region because the animals did not respond favourably to treatment unless it was administered very early. Losses also occurred as a result of vaccine reactions when the pamphlet was not carefully read and the prescribed procedure not followed. There was an abnormal number of outbreaks in the Piet Retief and Louis Trichardt State veterinary areas. Like redwater, the disease penetrated the Karoo areas of the Eastern Cape and Karoo Region and caused losses there.

There were few problems in the Homelands, except in kwaZulu, where there were a number of cases resulting from the same circumstances that caused the increase in the number of cases of redwater.

BESNOITIOSIS (ELEPHANT SKIN DISEASE)

There were outbreaks in the State veterinary areas of Rustenburg, Vryheid, Potgietersrus and Louis Trichardt. Isolated cases also occurred in the State veterinary areas of Barberton and Lydenburg.

Sporadic cases occurred in Venda, Gazankulu and Lebowa and there was an increase in the number of cases in the northern parts of Bophuthatswana. Altogether 16 000 cattle were immunised against the disease by officers in Bophuthatswana.

The use of the vaccine gives good protection.

COCCIDIOSIS

There were cases among lambs, calves and poultry in White areas throughout the country. In the Transvaal, Natal and Eastern Cape and Karoo Regions there were outbreaks among rabbits too. In one outbreak in the Pretoria State veterinary area *Eimeria maxima* was responsible within a week for the deaths of 800 out of 5 000 chicks. Serious problems were encountered among Angora lambs in the Eastern Cape and Karoo Region. It appears that a resistance against the remedies commonly used is developing in Natal.

VIRUS DISEASES

BLUETONGUE

There were more cases among vaccinated sheep in all the regions of the Division of Veterinary Services than there were in the previous year. It is possible that strains of the virus not included in the vaccine may have played a role. This has been confirmed in Northern Natal and serotyping is being continued by the Veterinary Research Institute.

In the Eastern Cape and Karoo, Free State and Winter Rainfall Regions the disease reached epizootic proportions and thousands of sheep died.

In the Homelands the disease caused problems only in kwaZulu.

Laboratory tests at the Veterinary Research Institute have proved that the bluetongue virus can multiply in 4 different species of *Culicoides*. So far it has only been possible to transmit the virus with *C. imicola* (= *C. pallidipennis*), but the other species are probably also involved in the epizootiology of the disease.

AFRICAN HORSESICKNESS

This disease was widespread in the Natal, Highveld and Transvaal Regions. Isolated cases with a fairly high mortality occurred in the State veterinary areas of Lydenburg and Barberton. In contrast with the previous year, when the disease caused serious problems in the Winter Rainfall Region, only one case was reported. There were a number of cases in the Free State Region; the symptoms were mild and there were few deaths.

Researchers at the Veterinary Research Institute continued with attempts to find effective

strains of the horsesickness virus, suitable for vaccine production, by means of clone selection, and to test the clones for their suitability as a vaccine. Candidate vaccine strains were readily developed for Types 1, 2 and 6 of the virus and suitable strains for Types 5 and 7 were also found after a considerable research effort. Clone-selected strains for all eight serotypes are now available.

Laboratory tests have demonstrated that the horsesickness virus can multiply in six different *Culicoides* species.



Virulent and attenuated Wesselsbron virus causes teratological abnormalities in the unborn lamb

HEARTWATER

This disease took a higher toll than usual in the infected areas of the country. The incidence in the Uplands region of the Mafeking district was very high and it seems that the disease has become established there.

EPHEMERAL FEVER (THREE-DAY STIFFSICKNESS)

Cases of three-day stiffness occurred throughout the Republic. In general the incidence

was not as high as the previous year except in the Eastern Cape and Karoo Region and in the State veterinary areas of Barberton and Lydenburg, where there were some deaths.

A few cases were reported from Venda, Gazankulu, Bophuthatswana and Lebowa.

The vaccine is still not being used sufficiently in most parts of the country.

RIFT VALLEY FEVER AND WESSELSBRON DISEASE

These diseases caused considerably fewer losses than they did the previous year. Contributory factors here were the increasing use of the vaccines as well as an animal population with a higher degree of acquired immunity. Towards the end of the year under review serious outbreaks occurred in the Kenhardt district. Rift Valley fever was only diagnosed in the Pietermaritzburg district in Natal and no cases were reported from the Northern and Eastern Transvaal Region.

Laboratory tests at the Veterinary Research Institute have confirmed the field observations of the previous year that the attenuated Wesselsbron vaccine, the attenuated Rift Valley fever vaccine and virulent Wesselsbron virus are the cause of various teratological abnormalities in unborn lambs.

BOVINE MALIGNANT CATARRH (SNOTSIEKTE)

Cases were reported from the State veterinary areas of Louis Trichardt, Lydenburg, Potchefstroom, Bethlehem, Hluhluwe, Eshowe, Bloemfontein and Rustenburg. Sixteen cattle died during the outbreak at Louis Trichardt.

In all the outbreaks there had been contact with blue wildebeest (gnu).

PULMONARY ADENOMATOSIS (JAAGSIEKTE)

This disease was diagnosed in outbreaks in the following districts: Wodehouse, Cathcart, Barkly East, Amersfoort, Pietermaritzburg and Vryheid.

Further progress has been made by the Veterinary Research Institute with research on this disease. It was possible to induce this disease in a further 10 lambs by intratracheal injection of cancer cell cultures. With the aid of cellular immunosuppressants the disease could be produced in 50 per cent of the experimental animals. The natural incidence of the disease is 5 to 10 per cent. Jaagsiekte was also induced in two sheep by the injection of fully fractionated cells, which means that either the cells contain a latent virus or the genetic matter of the cancer cell produced new cancer cells. It has been established with the aid of karyotyping that the cell culture by which the disease was transmitted contained male cells although originally derived from a ewe. This, together with the fact that the nasal discharge in an advanced case of jaagsiekte contains high

concentrations of living cancer cells, suggests that direct transmission of the disease from sheep to sheep is undoubtedly a possibility.

INFECTIOUS OPHTHALMIA

There were no serious outbreaks like those of the previous year in the Free State Region. The use of *Chlamydia* vaccine possibly helps to control outbreaks. In the Lydenburg State veterinary area there were severe outbreaks among sheep but in Natal the disease occurred mostly among cattle. Cases in cattle and sheep were diagnosed in the Highveld and Winter Rainfall Regions. Infectious ophthalmia was diagnosed in Queenstown and Middelburg (Cape) among sheep, and in QwaQwa two cattle were affected. This disease was not a problem in the other Homelands.

CONTAGIOUS PUSTULAR DERMATITIS (VUILBEK, ORF)

There were outbreaks of orf in all the regions. In the Eastern Cape and Karoo and Free State Regions the disease assumed epizootic proportions and lambs developed lesions on the lips, ears, hooves and even in the perineum. In addition to this there were also numerous cases of "mulberry foot" in the Free State Region. Affected animals mostly died. The number of outbreaks also increased in the Winter Rainfall Region. There were cases among goats in the Louis Trichardt State veterinary area and in Venda.

Autogenic vaccine prepared by the regional veterinary laboratories and State veterinary offices was mostly successful in controlling the outbreaks. Secondary fungal and bacterial infections complicated control measures.

MUCOSAL DISEASE

Only one case was reported; it occurred in the Queenstown district.

VIRUS DISEASES IN FEEDLOTS

No confirmed cases were reported. The release of the infectious bovine rhinotracheitis vaccine by the Veterinary Research Institute during the year under review contributed to this.

FUNGAL DISEASES

RINGWORM

Cases occurred in the Free State and Eastern Cape and Karoo Regions in calves and young cattle and in the Winter Rainfall Region horses and cattle were affected.

LUMPY WOOL

This caused more problems than in the past in the Winter Rainfall, Eastern Cape and Karoo and Free State Regions. In the latter region thousands of lambs died and even adult sheep were affected.

The disease was also diagnosed in the Lydenburg State veterinary area.



An excessive accumulation of amniotic fluid in the uterus is an abnormality caused by both attenuated and virulent Wesselsbron virus, as well as attenuated Rift Valley fever virus

STREPTOTHRICHOSIS

Dermatophilus congolensis infection of cattle was reported for the first time from Gazankulu and two animals died. The legs were severely affected. One of the affected animals recovered after treatment with antibiotics.

INFERTILITY AND VENEREAL DISEASES

Problems with infertility were encountered in all the regions, especially among cattle, sheep and goats. The commonest causes among cattle were poor management, malnutrition and deficiency diseases, but venereal diseases play an increasingly important role.

The regional veterinary laboratory at Stellenbosch examined the bulls from 42 dairy herds and one or more venereal diseases were diagnosed in 11 of the herds. The number of herd examinations carried out by the AI and Reproduction Section of the Division dropped from 95 herds with 4 938 animals to 55 herds with 2 278 animals, mainly because of the increase in the number of AI courses offered by the Section.

VIBRIOSIS

Infection with vibriosis was diagnosed in all the regions. The Stellenbosch regional veterinary

laboratory found infected bulls in two of the 42 herds examined. Of the 55 herds examined during the year by the AI and Reproduction Section, 16 herds were found to be infected with vibriosis, either alone or in conjunction with trichomoniasis. In one herd where both were diagnosed in the previous year and where the Section's advice on the use of the *Vibrio* vaccine, improved management and treatment for trichomoniasis had been applied, the pregnancy rate rose from 27 per cent to 66 per cent.

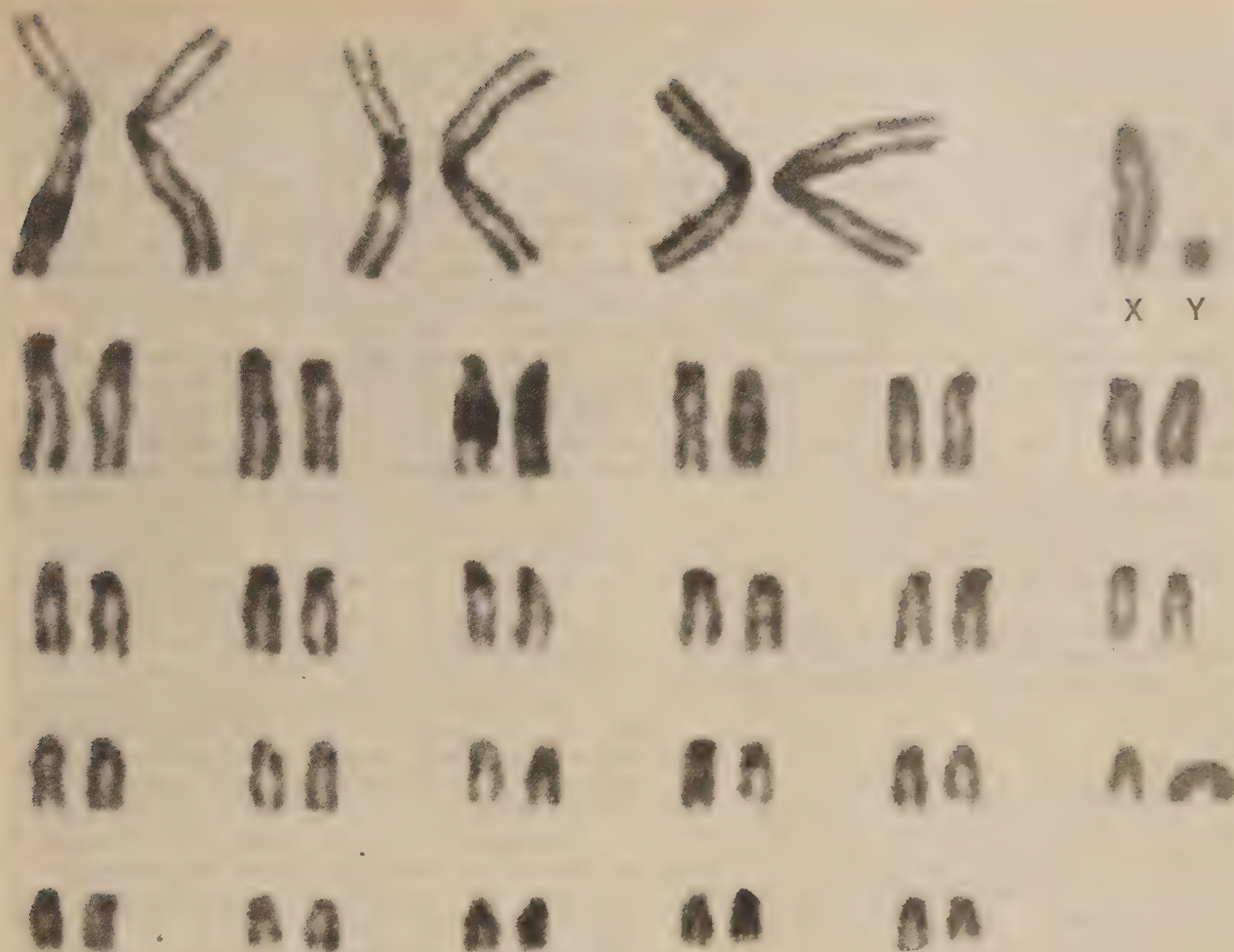
Mass production of the vaccine against vibriosis still presents problems and Onderstepoort is experiencing difficulties in meeting the demand.

The continued survey on the incidence of vibriosis in cattle carried out by the Veterinary Research Institute has indicated that the incidence remains low. Of the 4 840 specimens of both sexes examined, 5 per cent were positive. Comparative figures for 1974/75 and 1973/74 were 4 per cent and 13 per cent positive, respectively.

TRICHOMONIASIS

Of the 2 302 bulls which were examined by the Veterinary Research Institute during the year, 110 (4 per cent) were carriers of *Trichomonas foetus*, and of these 34 were infected with both *T. foetus* and *V. fetus*.

Cases of the disease were diagnosed in the Highveld, Winter Rainfall, Natal, Transvaal and



Karyotype of jaagsiekte cancer cells

Northern and Eastern Transvaal Regions and also in Venda. The Stellenbosch regional veterinary laboratory examined 247 sheath washings of bulls from 42 herds. Of these 11 were positive. Of the herds examined by the AI and Reproduction Section, nine were infected with trichomoniasis alone and three with vibriosis and trichomoniasis.

Methods for the treatment for trichomoniasis in bulls were further examined by the Section. Of the 56 bulls treated with various combinations of drugs, only one remained positive after treatment. Research in this connection is continuing.

CHLAMYDIOSIS

This disease occurred throughout the Republic again, but the incidence of abortions as a result of chlamydiosis was lower than in previous years. The disease caused abortions in cattle, sheep and even pigs (in Natal).

The organism, together with organisms such as *Pasteurella*, *Escherichia coli* and *Corynebacterium*, caused the death or stunting of thousands of young animals, especially in the Free State and Winter Rainfall Regions.

Experiments at the Veterinary Research Institute have shown that lambs born of infected

ewes, if they do not succumb to the infection, show retarded growth. A similar picture has been observed in the field. Chlamydiosis must, therefore, be regarded as a cause of unthriftiness in lambs.

ACTINOBACILLUS SEMINIS

This organism was once again responsible for infertility in rams in the Winter Rainfall, Free State and Eastern Cape and Karoo Regions. In some studs in the latter region up to 20 per cent of sale rams were affected.

BRUCELLA OVIS

The organism still causes infertility in rams. The Onderstepoort Rev I vaccine is very effective, however, and no cases were found in rams which had been correctly immunised.

STUDIES ON THE CAUSE OF THE "EPIVAG" SYNDROME IN CATTLE

Continued studies by the Veterinary Research Institute have shown, *inter alia*, that heifers, infected intravaginally with *Mycoplasma agalactiae* subsp. *bovis* and *Chlamydia psittaci* isolated from bulls with "Epivag" developed pronounced

peritonitis and pleuritis, a recognised manifestation of the natural form of the disease. Some heifers also showed the characteristic inflammation of the reproductive tract. In bulls typical lesions could only be produced by intra-epididymal injection of the above organisms.

The examination of sheath washings and/or semen from 283 bulls and specimens of vaginal mucus from 102 cows and heifers for the presence of mycoplasmas showed a positive result in 39 per cent of the bulls and in 8 per cent of the females.

Although *Mycoplasma bovis* was the commonest organism isolated, it has proved to be a saprophyte which occurs mainly in the lower parts of the canal. On the other hand *M. agalactiae* subsp. *bovis*, a strain normally associated with mastitis, was rarely isolated but is apparently involved with the "Epivag" syndrome.

STUDIES ON PERI-NATAL AND PRE-NATAL DEATHS

The comprehensive, country wide investigation on the infectious causes of this problem was continued by the Veterinary Research Institute.

(i) Cattle

Chlamydiosis was apparently again the commonest cause of abortions in cattle. The organism was isolated from 39 per cent of the foetuses examined, and in some cases *Brucella abortus*, *V. fetus*, *S. typhimurium* or Rift Valley fever virus was isolated as well.

Brucellosis was confirmed in 15 per cent of the 565 bovine foetuses examined. Sixty of the 64 isolates typed were classified as *B. abortus* biotype I, two as *B. abortus* biotype II and two proved to be the vaccine strain (Strain 19). The serological incidence of 11 per cent, obtained by the examination of 31 418 specimens, is virtually the same as that for the previous year.

The regional veterinary laboratory at Stellenbosch isolated *Brucella* organisms from 13 of the 48 foetuses submitted for examination. Ten of the 54 placentas were also found to be positive for brucellosis.

Q-fever was diagnosed in a further eight herds by isolating the organism from placental tissue. Its incidence is probably much higher, however.

Rift Valley fever once again proved to be an important cause of bovine abortions since the virus could be isolated from 24 (15 per cent) of the 163 foetuses examined.

Leptospirosis is probably a more important cause of pre-natal losses than has generally been assumed. Of the 83 herds in which it was suspected that abortions were caused by brucellosis but in which *Brucella* titres could not be demonstrated, 14 (17 per cent) were serologically positive for *Leptospira pomona*.

Vibrio fetus intestinalis OI could be isolated from six foetuses, ranging in age from 4 to 8 months, an indication that vibriosis should be kept in mind even in late abortions.

(ii) Sheep

Chlamydiosis was apparently responsible for 15 per cent of the abortions, a percentage slightly lower than that recorded the previous year.

Q-fever was only confirmed in one flock, and *B. abortus* was isolated from one of the 226 sheep foetuses examined.

Rift Valley fever apparently caused fewer cases of abortion in sheep than in the previous year, isolation of the virus being possible in only one outbreak of this disease.

Toxoplasmosis was incriminated for the first time in South Africa as a cause of abortion in sheep. The organism was detected by the regional veterinary laboratory at Stellenbosch in foetal membranes of aborted foetuses from a farm in the Durbanville district (60 out of 250 ewes aborted) and Onderstepoort established that the ewes concerned had particularly high antibody titres for toxoplasmosis, a clear indication of active infection.

(iii) Other animals

Abortions among pigs caused by *Escherichia coli* occurred on seven farms in the Winter Rainfall Region. The *E. coli* vaccine together with improved management and better housing controls the problem effectively.

Respiratory diseases in pigs caused considerable problems in this region and during the outbreaks the regional veterinary laboratory isolated *Bordetella bronchiseptica* on six farms, *Haemophilus* on two farms, both organisms on one farm, *Mycoplasma* organisms on three farms and *Pasteurella multocida* on two farms.

No abortions were caused by *Leptospira*, however.

Chlamydia infection in rabbits caused 12 of the 19 recognised rabbit farmers in the Winter Rainfall Region to give up their farming operations. Deaths among young rabbits were also caused by *E. coli*, *P. multocida* and *Staphylococcus aureus*. Experimental vaccines helped to reduce losses, however.

DISEASES OF CALVES

WHITE SCOURS

Escherichia coli again caused losses throughout the White areas of the Republic. As always, the occurrence of this disease is linked with bad management, poor hygiene and the insufficient use of the available vaccine. There were serious problems in the Winter Rainfall Region and the organism was isolated by the regional veterinary laboratory at Stellenbosch from 33 out of 84 calves on which *post mortem* examinations were done. Few dairy farmers raise their calves themselves, therefore they do not immunise their cows, with the result that the farmers who raise the calves are faced with the problem. There was a high mortality rate in the Ixopo state veterinary area in Natal.

No cases were reported from the Homelands.

PARATYPHOID

With the exception of the Natal Region, there were sporadic outbreaks with low morbidity and mortality in all the regions. There were two serious outbreaks in Natal and furthermore they occurred in calves 1 to 2 weeks of age. The problem was controlled with the help of the regional veterinary laboratory at Allerton.

No cases were reported from the Homelands.

The Onderstepoort vaccine is reasonably well used and gives good results provided that hygiene and management are improved as well.

According to the Veterinary Research Institute, *Salmonella dublin* is still the most important cause of paratyphoid in calves. Only about 15 per cent of cases were attributable to *S. bovis morbificans* and *S. typhimurium*.

COCCIDIOSIS

Sporadic cases were found among calves in all the regions and there were problems on some extensive farming operations in the Lydenburg and Barberton State veterinary areas. In Natal most of the problems occurred on artificial pastures.

The necessary treatment, together with grazing control measures, effectively controlled the condition except in Natal, where a resistance to the drugs commonly used seems to have developed.

CALF DIPHTHERIA

Isolated cases were found, in the Eastern Cape and Karoo Region only.

SWEATING SICKNESS

This disease was widespread in the Northern and Eastern Transvaal Regions and in the Vryburg State veterinary area. The incidence dropped in the endemic areas of the Transvaal Region, and the disease appeared sporadically in the Kimberley State veterinary area, the Natal Bushveld and Bophuthatswana. In the Highveld Region the only areas where the disease did not occur were the Hoopstad and Bethlehem State veterinary areas. Three cases were diagnosed at the Glen College of Agriculture.

VIRUS PNEUMONIA

No cases were reported.

REOVIRUS

Odd cases were diagnosed at Onderstepoort.

POST-NATAL DEATHS

It is reported from the Eastern Cape and Karoo, Winter Rainfall and Free State Regions that in addition to the above, the following organisms, either singly or together with above-mentioned organisms, were responsible for deaths amongst calves: *Chlamydia* and *Pasteurella*.

DISEASES OF POULTRY

INFECTIOUS BRONCHITIS

In contrast to the previous year the number of outbreaks in the Bloemfontein State veterinary area decreased. There were no further cases at the Glen College of Agriculture. The Onderstepoort vaccine is used fairly extensively.

The regional veterinary laboratory at Stellenbosch diagnosed the disease during 18 of the *post mortem* examinations done on fowls.

Isolated cases were reported from the Natal Region but no cases were reported from other regions.

INFECTIOUS CORYZA

Isolated cases were diagnosed in the Winter Rainfall and Natal Regions and in Venda. One case was reported from the Bethlehem State veterinary area.

The vaccine which was released by the Veterinary Research Institute last year has been improved by the addition of a second serotype which occurs on some farms, and by changing the formulation of the oil emulsion.

At the Veterinary Research Institute 75 cases were diagnosed and the organism was isolated in 20 cases.

CHRONIC RESPIRATORY DISEASE (MYCOPLASMOSIS)

In contrast with the previous year, there were considerably fewer cases diagnosed in the Winter Rainfall Region than in the past. The regional veterinary laboratory at Stellenbosch diagnosed 165 cases of mycoplasmosis during *post mortem* examinations. The same tendency was experienced in the Bloemfontein State veterinary area, where only one farm was affected and that after the holding pens had been flooded by storm waters. All 800 fowls were then slaughtered.

Isolated cases were diagnosed in Venda and Natal. In the Bethlehem State veterinary area 20 per cent of the fowls died during an outbreak.

At the Veterinary Research Institute 1806 haemagglutination inhibition tests and 4380 plate agglutination tests for mycoplasmosis were carried out.

FOWL POX

Isolated cases were diagnosed in Bophuthatswana and the Winter Rainfall and Free State Regions. There were two outbreaks among fowls and turkeys in the Bethlehem State veterinary area. The disease was widespread among fowls that had not been immunised in the coastal areas of the Eastern Cape and Karoo and Natal Regions.

GUMBORO DISEASE

Four outbreaks in the Winter Rainfall Region were diagnosed by the regional veterinary laboratory at Stellenbosch.

The disease was diagnosed for the first time in Natal and, what is more disturbing, it occurred in more than one poultry holding.

EPIDEMIC TREMOR

No cases were diagnosed.

MAREK'S DISEASE

According to the State veterinarian at Bloemfontein, the disease was responsible for 52,5 per cent of the deaths that occurred among the pullets taking part in the random sample egg production tests at the Glen College of Agriculture.

DISEASES OF FISH

Further attention has been paid by the Veterinary Research Institute to the diagnosis of and research on fish diseases. A mass mortality of blue kurpers, yellow kurpers and carp at a certain recreation dam could be traced to a lack of oxygen in the water.

Continued research on the pathogenicity of the bacterial disease caused by *Streptococcus faecalis* in fish species showed that vlei kurpers, blue kurpers and carp were not susceptible even at near maximum water temperatures. Trout are apparently the only species susceptible to the disease, and a relatively high water temperature is seemingly required for the occurrence of the disease.

DEFICIENCY AND NUTRITIONAL DISEASES

Malnutrition and deficiencies did not play as important a role as during the previous year, mainly because of the good rains. In the Free State Region, however, problems with sheep were encountered because of the luxuriant growth of the veld, which rapidly lost nutritional value so that supplementary feeding became necessary. Atony of the forestomachs as a result of the low protein intake consequently caused problems throughout the region.

The regional veterinary laboratories at Stellenbosch and Allerton again rendered valuable service to farmers and State and private veterinarians with regard to the determination of the metabolic profiles of cattle, horses and sheep.

In the Homelands malnutrition was found chiefly as a result of overgrazing, udder damage caused by ticks, too much milk being taken for human use and not enough left for the calf, and the burning of veld just after winter.

A **phosphate deficiency** still plays a role, especially in winter, in the Northern and Eastern Transvaal, Free State, Highveld and Natal Regions. In the Louis Trichardt State veterinary area supplementing phosphates in the drinking water raised the calving percentage on a specific farm by 30 per cent, to 89 per cent.

A **Vitamin A deficiency** led to blindness in sheep in the Swellendam State veterinary area. Problems were also encountered in the Highveld and Natal Regions during the winter months. An exceptionally high nitrite concentration in borehole water led to a vitamin A deficiency in cattle in the Pretoria State veterinary area. The problem was solved by leading the water through a colony of bacteria where consequent breakdown of the nitrites took place.

Vitamin E deficiency in the form of white muscle disease caused the death of 50 lambs that grazed exclusively on lucerne next to the Lower Orange River. A vitamin E: selenium imbalance caused problems among calves on three State-owned farms in the Pretoria State veterinary area. Young chickens died of vitamin E deficiency in Venda and in the Bloemfontein State veterinary area.

Swayback in lambs again took its toll in the State veterinary areas of Mossel Bay, Swellendam and Malmesbury as a result of a **copper deficiency** in the grazing. Problems were also encountered with the incorrect administration of injectable copper remedies to rectify deficiencies. Farmers in the North-Western Cape were informed that there was a zinc deficiency in that area and advised to add 3 per cent zinc sulphate to their licks. Two to three months later the sheep began to drop dead when they were driven. Laboratory tests showed that the condition was caused by a copper deficiency as a result of an excess of zinc. When the licks were corrected the problem disappeared.

A copper deficiency among cattle was diagnosed in the Bethlehem district.

A **magnesium deficiency** caused stiffness, tremors and convulsions among cattle on green feed in the Eastern, Central and Southern Free State.

A **calcium deficiency** again caused problems among broilers in the Bloemfontein State veterinary area. In the Winter Rainfall Region a hypocalcaemia among sheep on green feed occurred due to a calcium:phosphate imbalance and the high potassium content of the grazing.

A **zinc deficiency** in the ration of pigs on two pig farms in the Winter Rainfall Region led to a 22 day delay in marketing. Zinc deficiency was also diagnosed in pigs in the Bethlehem State veterinary area.

There were no problems this year with *enzootic icterus* in the Eastern Cape and Karoo Region but 30 out of 90 sheep died of *enzootic icterus* when they were transported from this region to the Winter Rainfall Region.

Pregnancy toxæmia (*domsiekte*) caused deaths in sheep in Gordonia and the Winter Rainfall Region.

Milk fever was severe in the Winter Rainfall Region. The regional veterinary laboratory at Stellenbosch reports that 70 per cent of the cows in one herd that calved developed milk fever. Some cases were followed by an acute toxæmia, diarrhoea, rapid collapse and death. *Escherichia coli* was isolated from virtually all organs in such

cases. Preventive measures against milk fever and the administration of *E. coli* vaccine solved the problem.

Isolated cases of *acidosis* occurred among cattle in feedlots in the Free State Region.

Eighty-three cases of nutritional deficiencies among poultry were investigated by the Veterinary Research Institute. A **vitamin E deficiency** and **calcium imbalance** were the commonest causes.

POISONING

MINERAL POISONING

Cases of mineral poisoning, mostly due to carelessness or accidental intake of the poison, were reported from all parts of the Republic.

Arsenic took its toll in the Highveld, Northern and Eastern Transvaal, Natal, Winter Rainfall and Free State Regions, as well as in kwaZulu. Fourteen cattle died in Louis Trichardt after a dip containing arsenic overflowed and they drank from it. In kwaZulu 17 cattle died because the dip mixture was too strong. The number of specimens tested for arsenic by the Veterinary Research Institute decreased, however.

Organic phosphates and *chlorinated hydrocarbon* insecticides were responsible for most of the cases of poisoning investigated by the Veterinary Research Institute this year. Cases of poisoning due to the former have doubled owing to the increase in its use.

Dieldrin caused the death of a bovine in the Highveld Region and that of 12 cattle in the Transvaal Region.

Ektafos at too high a concentration caused the death of nine stud Brahman cattle in the Rustenburg State veterinary area. Seven cattle also died in the Barberton State veterinary area as a result of *ektafos* poisoning.

Diazinon was responsible for the death of cattle and pigs in the Mossel Bay State veterinary area. Cattle died in the vicinity of Olifantshoek as a result of a specific batch of a certain insecticide containing diazinon chemically breaking down and forming the extremely poisonous substance sulphotep.

Thiodan poisoned nine cattle in the Stellenbosch State veterinary area. After treatment four recovered.

Toxaphene caused deaths in the Natal and the Northern and Eastern Transvaal Regions.

An *organophosphatic* dip was responsible for the deaths of 12 cattle in Gazankulu after it was mixed with oil and then smeared onto the animals.

A *chlorinated hydrocarbon* insecticide was sprayed on sawdust placed in a chick pen and caused the death of some of the chicks.

The number of cases of *urea* poisoning is slowly increasing according to the Veterinary Research Institute. This is mainly the result of too high a concentration in rations and the incorrect composition of licks and blocks. Fourteen sheep died of *urea* poisoning in the Calvinia State veterinary area. Thirty goats died and 20 cattle

were poisoned, 19 of which recovered after treatment, in the Lydenburg State veterinary area, while 13 cattle died at Barberton. There were also cases in the Natal Region.

Nitrate poisoning caused deaths in the Natal and Free State Regions. The Kuruman and Vryburg districts had the most cases as a consequence of the particularly high concentration of nitrates in the borehole water there.

Salt poisoning was responsible for the deaths of seven cattle and for affecting 40 others in the Bloemfontein State veterinary area. The animals had been without a salt lick for a long time and when it was again made available, it led to poisoning. According to the Veterinary Research Institute there were a number of cases among cattle, pigs and chickens.

Zinc phosphide killed sheep in Middelburg (Cape) after they had eaten wheat treated with this substance.

2-3-4 fertiliser mixed with concentrates caused the death of 29 sheep and two cattle on a farm in the Bloemfontein district.

Strychnine poisoning among dogs remains the commonest form of poisoning in cities and towns. Ten dogs died in the Piet Retief district and 12 in Postmasburg.

The Veterinary Research Institute states that many farmers regard *sulphur* as harmless but that deaths among cattle and pigs could be ascribed to an excessive intake of sulphur.

PLANT POISONING

According to reports from the Regions and the Homelands the following plants have caused stock deaths: *Homeria* and *Moraea* spp. (tulp) in all seven regions; *Senecio* spp. (sprinkaanbos) in the Eastern Cape and Karoo, Natal, Winter Rainfall and Free State Regions; *Geigeria* spp. (vermeerbos) in the Highveld and Free State Regions; *Pachystigma*, *Pavetta* and *Fadogia* spp. (gousiekte) in the Highveld and Northern and Eastern Transvaal Regions as well as in Lebowa; *Urginea* and *Ornithoglossum* spp. (slangkop) in the Highveld and Free State Regions; *Crotolaria* spp. in the Transvaal (183 cattle affected in the Thabazimbi district) and Free State Regions and in Lebowa; *Lantana camara* in the Natal and Northern and Eastern Transvaal Regions; *Cestrum laevigatum* (inkberry) in the Highveld and Natal Regions; *Sarcostemma viminale* (climbing milkweed) in the Free State and Winter Rainfall Regions; *Matricaria* spp. (staggers) and *Pteridium aquilinum* (bracken fern) in the Natal Region; *Cotyledon* spp. *Ornithogalum* spp. (chinkerinchee), *Chrysocoma tenuifolia* (bitter Karoo), *Asaemia axillaris* (vuursiekte), *Hermannia paucifolia* (Scholtz bush), *Melanthus major* (honey flower), *Zygophyllum microcarpum* (sandripuis) and *Galaenia africana* (waterpens) in the Winter Rainfall Region; *Dichapetalum cymosum* (gifblaar), *Solanum* spp. and *Acacia nilotica* in the Northern and Eastern Transvaal Region; *Datura* spp. and *Panicum* spp. in the Highveld Region; *Dipcadi*

glaucum (poison onion) and *Arthrosolen polycephalus* (January bush) in the Free State Region; and *Amaranthus* spp. (cockscorn) and *Lasiospermum* spp. (ganskweek) in the Eastern Cape and Karoo Region.

Plants containing *prussic acid* caused deaths in all the regions with the exception of the Transvaal and Northern and Eastern Transvaal Regions.

Cases of **geeldikkop** were less frequent than in the past in the Eastern Cape and Karoo Region. Isolated cases were also diagnosed in the Winter Rainfall Region. *Photosensitivity* was found in the Free State Region and in kwaZulu but the cause could not be ascertained.

Grassballs caused problems in the Calvinia State veterinary area.

Acorns caused deaths in cattle in the Winter Rainfall Region.

TOXINS

Diplodia zae poisoning was reported from the Highveld Region.

Aflatoxicosis caused by mouldy groundnuts occurred in the Northern and Eastern Transvaal Region. In Natal mouldy brewer's grain also caused this condition. *Aspergillus fumigatus* caused the death of 25 out of 270 cattle during an outbreak in the Transvaal Region.

Cases of *lupinosis* occurred in the Winter Rainfall Region. The regional veterinary laboratory at Stellenbosch succeeded in isolating *Pithomyces chartarum* from artificial pastures after cases of facial eczema had appeared. Problems on two pig farms were also ascribed to mouldy feeds by this laboratory.

The occurrence of fungal poisoning was fairly general.

INTERNAL PARASITES

This year, like the previous one, was particularly favourable for internal parasites. Even in the Winter Rainfall Region where there were no serious problems last year, losses due to internal parasites were particularly high, especially in the areas where there is normally a low rainfall.

Haemonchus spp. (wireworm) caused problems in all the regions and Homelands. In the Free State Region the parasite is undoubtedly developing a resistance against some of the generally used remedies and in some places dosing has to be done every two weeks to control the parasites to some extent. Fifteen pregnant blesbuck died in the Bethlehem State veterinary area from wireworm infestation.

Oesophagostomum spp. (nodular worm) infestations were very heavy in the Free State and Natal Regions and in Lebowa.

Trichostrongylus spp. (bankrupt worm) were prominent in the Free State and Winter Rainfall Regions (especially in the areas with a winter rainfall).

Trichuris ovis (whip worm) was responsible for problems in the Free State Region.

Ostertagia spp. (brown stomach worm) and *Nematodirus* spp. (long-necked bankrupt worm) were responsible for losses, especially in the Winter Rainfall Region.

Strongyloides spp. caused deaths among calves in Venda and Gazankulu and also caused problems in the Free State Region.

Schistosoma spp. (bilharzia) was widespread in cattle in the Mokerong district of Lebowa.

Paramphistoma spp. caused losses in the Free State, Transvaal and Highveld Regions.

Serious problems with *Fasciola* spp. (liver fluke) were encountered in the Winter Rainfall Region (on artificial pastures under irrigation) and in the Natal, Highveld and Transvaal Regions. In one case in the latter region 30 out of 150 cattle died of acute liver fluke infestation.

Young calves and lambs were heavily infested with tapeworms and there were losses in the Highveld, Natal, Free State and Winter Rainfall Regions as well as in Lebowa and Bophuthatswana.

Stilesia hepatica (liver tapeworm) is still responsible for the fact that 90 to 95 per cent of sheep livers in the Free State Region are unfit for human consumption.

Oestrus ovis (nasal worm) infestations occurred in the Free State, Winter Rainfall and Transvaal Regions.

Measly carcasses formed 2 per cent of all cattle slaughtered in the Vryburg State veterinary area. In the Northern and Eastern Transvaal the infestation in cattle varies between 4 and 12 per cent and most of the district agricultural unions have started campaigns to treat farm workers against tapeworm in an attempt to reduce the incidence.

Further investigations by the Veterinary Research Institute into the use of gamma rays to make measly carcasses edible have indicated that measles in cattle is more sensitive to irradiation than the condition is in pigs.

Parafilaria bovicola occurred for the first time in cattle in the Kuruman district. Infestations were widespread in the Rustenburg State veterinary area and the lowveld parts of the Northern and Eastern Transvaal Region as well as in Gazankulu.

The problem of parafilariasis is still being investigated by the Veterinary Research Institute. Follow-up research at the Mara Research Station has confirmed that male animals are more susceptible to infestation by *Parafilaria* than females. Bulls, which act as vectors, are probably largely responsible for the spreading of the disease to as yet uninfested farms and areas. The Kuruman district, for instance, has only recently been found to be infested. There are indications in oxen and especially in female animals that, the incidence decreases as the animals get older, that is the animals apparently develop a measure of immunity against infestation.

Laboratory experiments have indicated that cattle probably contract the infestation when the infested vector flies feed on skin lesions. Bite wounds, such as those made by horseflies, the

umbilical cord of newborn calves and even *Parafilaria* bleeding spots are all probably entry points for the larvae. The most suitable time for infestation to take place is September to October. It takes about 8 to 9 months before an infested animal begins to bleed. Surveys have indicated that the three known vector flies referred to in previous reports constitute 70 per cent and 76 per cent of the total fly populations, collected from cattle, at the Zoutpan Research Station and at Mara, respectively. It was also discovered that flies act as vectors of the eyeworm, *Thelazia*.

Studies extending over 8 months on the economic importance of the disease have disclosed that 30 per cent of the carcasses examined were infested with *Parafilaria*. Furthermore, the average loss from meat cut away because of the presence of lesions amounted to 0,9 kg per infested carcass.

Continued therapeutic studies have shown that the anthelmintic nitroxylin at 20 mg/kg gives slightly better results than levamisole, which is also fairly effective. The toxicity of nitroxylin, however, requires further investigation.

EXTERNAL PARASITES

As in the previous year, ticks caused problems in many parts of the Republic. In contrast with the previous year problems with ticks were also encountered in Natal because of the torrential rains, which interfered with the regular dipping of animals. Tick-borne diseases were widespread and there was an increase in abscesses and cases of tick toxicosis.

Amblyomma spp. were prominent in the Natal and Northern and Eastern Transvaal Regions, the western parts of the Highveld Region and in Venda and Gazankulu.

Boophilus spp. were numerous, especially in the Transvaal (a decrease occurred in the autumn, however), Natal and Northern and Eastern Transvaal Regions.

B. microplus was also identified for the first time in QwaQwa and the Eastern Free State.

Rhipicephalus appendiculatus (brown tick) was found in disturbing numbers in the Northern and Eastern Transvaal Region and resulted in lots of problems with abscesses.

Rhipicephalus evertsi was particularly abundant in the Eastern Free State and Natal.

Ixodes rubicundus (Karoo paralysis tick) caused losses in the Free State Region and in the Calvinia State veterinary area.

RESISTANCE OF TICKS TO CATTLE DIPS

The phenomenon of the resistance of ticks to cattle dips has been further investigated at the Veterinary Research Institute by means of tests on larvae and adult ticks. This survey has shown that approximately 19 per cent of the ticks representing the five most important species have varying degrees of resistance to arsenical, chlorinated hydrocarbon and organophosphatic dips. The

degree of resistance was generally low and so of no practical significance provided the dip was used at the recommended strength.

Among blue ticks it was established that true resistance to certain organophosphates, viz. quintophos and dioxathion, which was encountered on some farms in the Transvaal and Natal last year, has become slightly more widespread. To this list should be added farms in the Tzaneen, Gravelotte and Vaalwater areas. The dip chlorfenvinphos is still capable of controlling this kind of resistance.

Resistance to camphechlor was discovered in red ticks from the Northern Transvaal and Natal, and in blue, red and brown ear ticks from the Ciskei. A more alarming development was the confirmation of resistance to quinalphos, dioxathion and chlorfenvinphos by a strain of bont ticks which was submitted from a farm in Northern Natal. This strain can be successfully controlled, however, by the new non-organophosphatic dips, amitraz and chloromethiuron.

BIOLOGICAL CONTROL OF TICKS

Experiments at the Veterinary Research Institute have yielded promising results. For instance, it was found that a population of 15 bantams will eliminate 93 per cent of a sand tampan population of 32 000 in an area of 100 m² in 31 days.

Analyses of the stomach contents of tickbirds showed that the average number of ticks per bird was 386, but as many as 1 655 were found in one of them. Furthermore, controlled laboratory tests have indicated that a tickbird eats 66 to 72 adult *Boophilus* females a day and that four birds control 98 to 99 per cent of the adult tick population on an animal in 10 days.

Sheep lice infestations were found in all the regions except in the Northern and Eastern Transvaal Region. Although infestation occurred in the Transvaal Region, few problems were experienced. Lebowa and QwaQwa also confirmed cases of infestation by these parasites.

Melophagus ovinus (sheep ked) caused problems in the Winter Rainfall, Natal and Eastern Cape and Karoo Regions. The fly is common in Lebowa and infestations have also been identified in the Ciskei and QwaQwa.

Infestation by the Australian itch mite *Psorergates ovis* was confirmed in the Free State, Winter Rainfall and Eastern Cape and Karoo Regions.

Problems with blowfly strike were experienced in the Transvaal, Free State and Winter Rainfall Regions. The blowflies are developing a resistance to available remedies in the Riversdale district.

Field trials carried out by the Veterinary Research Institute proved that more effective protection against blowfly strike was obtained with dipping (4 to 6 weeks) than with hand dressing or spraying (3 to 4 weeks). The only preparations available for use were the organophosphatic dips and of these diazinon gave the best results. In

laboratory tests with blowfly strains with a resistance to the ordinary pesticides, phenthion-ethyl gave the most promising results. The insecticide will also be tried out under field conditions.

Mosquitoes, midges and gnats were present in such great numbers in the North-Western Cape and parts of the Free State that animals were attacked by millions of them and were unable to graze or drink water. Diseases transmitted by insects consequently increased and there were production losses as a result of irritation, dermatitis and toxicosis.

According to the Veterinary Research Institute the mosquito *Culex theileri* was again effectively controlled by predatory and competing insects that breed in water, but *Aedes juppi* and *Aedes caballi* reached pest proportions. Since temporary pools of shallow water serve as breeding places for these species and their eggs resist desiccation very well, biological or natural control is unlikely and the use of chemical pesticides will have to be considered. Of the granulated insecticides which were tested, phenthion was 100 per cent effective for 30 days in both clean and polluted waters.

Various *Musca* spp., *Tabanidae* and *Stomoxys* spp. were particularly troublesome to animals in the Free State Region. *Musca crassirostris* ("wildebees" fly), which had been prevalent the previous year, disappeared because of the high rainfall and did not cause problems in the Vryburg State veterinary area again.

Hypoderma bovis larvae were again found in animals at the Jan Smuts quarantine station. Animals from infested countries are subjected to routine treatment. A living larva was found in an animal in the Bethlehem State veterinary area and the herd was treated again. Thereafter no living larvae were found.

Of the six drugs with a lethal contact effect on the stable fly *Stomoxys calcitrans* which were tested by the Veterinary Research Institute for their residual effect, chlorfenvinphos proved the most promising, since 12 days after its application it still accounted for a 50 per cent fly mortality; coumaphos (in oil) was able to maintain this level on the 9th day.

VETERINARY RESEARCH

BASIC VETERINARY RESEARCH

Orbi viruses

Continued research at the Veterinary Research Institute on the characterising of isolates of viruses has shown the presence of a group of viruses which are serologically related to each other and belong to the orbi viruses (diplorna viruses). These are associated with various disease syndromes, such as encephalosis, abortion, cardiac failure and fever of unknown origin in horses.

Viruses and infertility in pigs

Sixty-two foetuses of pigs from 27 farms were examined for virus infections by the Veterinary Research Institute during the year. Only parvovirus could be isolated and the incidence of the infection, as deduced from virus isolations and serological tests, was particularly high (81 per cent). The significance of these virus strains is not yet clear, however, since their pathogenicity for pregnant sows has not yet been ascertained.

Long-term storage of internal parasites

Pure strains of seven different worm species from sheep and five from cattle were successfully stored at the Veterinary Research Institute for about two years in a frozen condition in the gaseous phase of a liquid nitrogen freezer, an advance which means, *inter alia*, a great saving in the use of donor animals which in the past had to be kept for the maintenance of such strains.

Mycotoxicosis

It has been found by the Veterinary Research Institute that the fungus *Fusarium moniliforme* which occurs in mouldy maize, not only causes the reported liver syndrome, but is also responsible for brain lesions in horses. The affected animals exhibit a variety of nervous symptoms which include hypersensitivity, dementia, partial paralysis and ataxia.

MISCELLANEOUS RESEARCH AND PROJECTS

During the year officers of the Division of Veterinary Services registered two new projects, continued research on six projects and finalised or stopped research for various reasons on another six.

On 30 June 1976 the Veterinary Research Institute had 143 registered projects. A further 32 were undertaken and 15 were finalised during the year.

Research on game and diseases of game

This work was continued in the Kruger National Park.

Brucella abortus (Biotype I) was isolated from buffaloes and its pathogenicity for cattle will be determined by the Veterinary Research Institute. Because abortions in buffaloes are rare, the effect of this organism on them will be investigated further.

Hippopotami, buffaloes and elephants were found to be serologically positive for *bluetongue* but all the blue wildebeest (gnu) specimens tested were negative. Blue wildebeest, buffaloes, an impala, a giraffe, a kudu and a warthog were experimentally infected with *bluetongue* but no typical lesions or symptoms developed.

During the year *anthrax* organisms were isolated from old bones collected in the Malelane and Satara areas. It appears, therefore, that sporadic cases of anthrax do occur in the southern part of the Kruger National Park.

Notwithstanding the fact that last year a lesion caused by a *Mycobacterium* sp. was found in the lung of an elephant, no such lesions could be found in the year under review.

Mange was widespread in the Kruger National Park. *Notoedres cati* caused some lion cubs in the Skukuza area to be virtually hairless. Treatment with diazinon at a dilution of 1:600 was effective. This mite also caused cases among leopards.

Cases of *sarcoptic* mange occurred in impala and blue wildebeest (gnu) and clinical cases among giraffes and kudu were noticed in the Satara area.

Various cases of *abscessation* were found among impala. *Staphylococcus* and *Corynebacterium* were isolated as the causative organisms.

Cases of *actinomycosis* were again found among impala in the Skukuza and Kingfisherspruit areas.

Cases of *papillomatosis* were again noticed among giraffe, but there were no cases in other animals.

Sixty-three per cent of the elephants inspected at the abattoirs at Skukuza showed lesions in their lungs caused by *Herpes virus*.

Roan antelope calves died near Pretoriuskop after ticks had caused abscesses on the udders of their dams. The calves developed pica, and large amounts of riversand were discovered in their intestines during *post mortem* examinations. At the same time *Corynebacterium* lung abscesses were found in the calves.

Pneumostromylus was found in the lungs of 14 per cent of the impala inspected at the Skukuza abattoir. Similarly 94 per cent of the livers of elephants were found to be infected with *Grammocephalus calthratius*, four per cent of the impala livers were infected with *Stilesia hepatica*, 43 per cent of the hippopotamus livers with *Fasciola* spp., and 68 per cent of the buffalo livers were infected with *Linguatula* spp.

Seventeen per cent of the buffalo tongues were condemned because of infection with *Sarcocystis* spp. and isolated cases of *Echinococcus* cysts were found in buffaloes.

The keeping qualities of venison were experimentally investigated and it was found that an impala carcase with the intestines removed was still fit for human consumption 48 hours after it had been shot and showed no signs of decomposition.

Trichinella-infested meat was stored at -18 °C and fed to mice after 7, 14, 21 and 28 days. After 26 days no *Trichinella* cysts were found in the mice. Infested meat was also converted to biltong and fed to mice. The biltong did not infect the mice.

It is known that various game species in East Africa are infected with *Toxoplasma*. In the Kruger National Park infection has been found in lions,

hyenas and baboons. A survey was begun during the year to determine whether buffaloes and elephants are also affected.

Heartwater-infected blood was injected into four impala, a buffalo, a kudu, a giraffe, a warthog and two blue wildebeest (gnu). A control sheep developed the disease but none of the other animals developed any symptoms. However, it was not possible to determine whether the game have a natural immunity or whether they had previously undergone infection.

VACCINE PRODUCTION

In terms of the total number of doses of vaccine issued by the Veterinary Research Institute during 1974/75 (170 696 034) (includes monospecific Horsesickness type 4) and 1975/76 (170 921 299) the production appears to have remained static. This is, however, not a true reflection of the situation, since the demand for certain vaccines which are comparatively easy to prepare dropped markedly (for example Newcastle disease vaccine) while other more complicated vaccines which are also more expensive (for example *E. coli* for pigs and inactivated Rift Valley fever vaccine) increased.

A truer picture is obtained when the incomes from vaccine for the two periods are compared. In 1974/75 the income was R1 449 593,00, whereas in 1975/76 it amounted to R1 842 976,63. This represents an increase of approximately 27 per cent and that without any increase in the unit price.

Of the total production, 11 292 847 doses of vaccine costing R121 650,52 were exported, mainly to neighbouring states.

The demand for the *E. coli* vaccine for pigs, and the fowl typhoid, brucellosis and blackquarter vaccines increased substantially. Nearly 142 000 doses of *Vibrio fetus* vaccine were issued compared with 13 100 the previous year, but despite this effort the demand could not be met.

The demand for rabies vaccine increased from a total of 242 970 doses the previous year to 387 315 doses. This caused a shortage of eggs which hampered the production of enzootic abortion (*Chlamydia*) vaccine. Despite this 2 956 200 doses of *Chlamydia* vaccine were produced.

The sale of bluetongue vaccine also increased from 18 866 100 to 26 167 620 doses because of the particularly favourable conditions in the field for the spread of the disease. Although an increase of 7 301 520 doses might not appear very spectacular, it should be noted that this vaccine contains nine different virus strains and is therefore particularly difficult to prepare. Similarly, sales of inactivated Rift Valley fever vaccine jumped dramatically. The production of live Rift Valley fever vaccine, which is comparatively easy to prepare, dropped from 12 183 700 to 9 210 450 doses.

Conversely, there was a marked drop (10 998 140 doses) in the demand for Newcastle disease vaccine (Komarov). This can be attributed to the fact that large poultry establishments use imported vaccines extensively.

Only one new vaccine, that against infectious bovine rhinotracheitis, for use in feedlots, was introduced during the year. To date 62 450 doses have been sold.

The potency and keeping quality of the redwater vaccine was improved to such an extent that the dosage could be decreased and the shelf-life increased.

The following is a list of the vaccines and diagnostic reagents and the number of doses of each which were sold from 1975/07/01 to 1976/06/30:

Apart from these, a number of experimental vaccines and antigens, listed at the top of the next page, were also produced.

The following vaccines were produced by State veterinarians and by the regional veterinary laboratories:

Heartwater	3 585 doses
Autogenic wart vaccine	6 721 doses
Contagious pustular dermatitis (orf)	23 510 doses

	1973/74	1974/75	1975/76
Bacterial vaccines			
Enterotoxaemia (oil adjuvant)	-	33 840 520	17 043 850
Enterotoxaemia (alum-precipitated toxoid)	-	669 700	23 380 000
Enterotoxaemia (total)	39 357 500	34 510 220	40 423 850
Lamb dysentery	409 870	2 414 100	310 650
<i>Brucella</i> (cattle)	1 889 999	2 366 269	2 720 796
<i>Brucella</i> (sheep)	514 300	581 860	490 250
<i>Corynebacterium ovis</i>	156 520	117 000	144 300
<i>Corynebacterium pyogenes</i>	348 180	374 460	363 100
Swelled heads in rams	23 270	63 320	66 850
Colibacillosis (cattle and sheep)	41 570	61 910	72 750
Colibacillosis (pigs)	74 930	86 600	182 400
Fowl typhoid	2 469 100	2 224 848	4 198 500
Botulism	5 363 070	4 984 580	5 016 505
Leptospirosis	1 710	4	-
Bovine pleuropneumonia (lungsickness)	575 360	716 640	242 160
Anthrax	15 936 950	16 520 100	13 402 307
Paratyphoid (live vaccine) (calves)	364 656	369 022	234 302
Paratyphoid (inactivated)	-	-	28 020
<i>Pasteurella</i> (sheep and cattle)	1 039 220	1 371 080	1 518 660
Black-quarter (quarter-evil)	7 257 052	7 333 068	10 243 118
Tetanus	195 850	131 490	128 330
<i>Vibrio fetus</i>	-	13 100	141 900
<i>Haemophilus gallinarum</i>	-	10 000	1 230 800
Total for bacterial vaccines	76 019 107*	74 249 671*	81 259 548
Virus vaccines			
Enzootic abortion (Chlamydia)	2 164 200	5 002 100	2 956 200
Bluetongue	25 366 550	18 866 100	26 167 620
Pigeon pox	1 200 000	569 600	525 180
Fowl pox	4 429 800	3 095 700	2 816 100
Distemper	31 965	30 827	36 673
Rabies (LEP for dogs)	165 289	209 866	323 211
Rabies (HEP for cats)	17 279	32 704	64 004
Infectious bronchitis (poultry)	2 291 000	2 251 000	265 000
Infectious laryngotracheitis (poultry)	1 200 000	9 111 000	4 999 000
Lumpy skin disease	744 977	420 991	1 072 899
Newcastle disease (poultry) (Komarov)	37 481 600	36 557 400	25 559 260
Horsesickness	184 861	191 265	182 299
IBR (Infectious bovine rhinotracheitis)	-	-	62 450
Rift Valley fever (live vaccine) (sheep)	601 600	12 183 700	9 210 450
Rift Valley fever (inactivated) (cattle)	-	1 007 200	3 776 765
Wesselsbron disease	148 570	5 954 550	7 816 450
Ephemeral fever (three day stiffness)	-	50 890	224 465
Total for virus vaccines	75 719 091**	95 534 893**	88 445 026
Protozoal and rickettsial vaccines			
Anaplasmosis (gallsickness)	524 923	595 844	890 413
Heartwater blood	78 377	94 648	101 019
Redwater	106 972	95 914	117 583
Elephant skin disease (besnoitiosis)	61 145	89 840	107 710
Total for protozoal and rickettsial vaccines	771 417	876 246	1 216 725
Grand total for all vaccines	152 509 615**	170 661 810**	170 921 299
Diagnostic aids (antigens): Number of units			
BWD antigen	54 740	31 980	48 390
<i>Brucella abortus</i> antigen	29 200	32 820	27 090
<i>Brucella</i> milk ring test antigen	612	558	1 353
Mallein	120	-	-
Tuberculin (bovine)	642 900	759 420	840 770
Tuberculin (avian)	199 102	290 620	249 740
<i>Mycoplasma gallisepticum</i> (CRD) antigen	-	134 700	103 800
Total for diagnostic antigens	926 683	1 250 098	1 271 143

*Excluding *Chlamydia*

**Including *Chlamydia* and excluding Horsesickness type 4

		Doses	<i>Brucella</i> agglutination tests	54 659
			<i>Brucella</i> milk ring tests	14
1.	Vaccines		FA tests	872
	<i>Haemophilus gallinarum</i> bivalent vaccine	165 000	PPLO tests	15 764
	<i>Staphylococcus</i> (rabbits, sheep, cattle and dogs)	11 750	Vibriosis	778
	<i>Pasteurella</i> (sheep and rabbits)	9 250	Trichomoniasis	247
	<i>E. coli</i> -parental (pigs, rabbits and chinchillas)	14 000	Johne's disease	1
	<i>E. coli</i> -oral (pigs)	for 4 tons of feed	Leptospirosis	676
	<i>Cl. septicum</i>	149 390	<i>Actinobacillus seminis</i>	21 241
	<i>Leptospira pomona</i> (pigs and cattle)	8 350	Pasteurellosis	1 448
	Total	357 740	Chlamydiosis	1 530
2.	Antigens		<i>Chlamydia</i> isolations	25
	Rose Bengal (<i>Brucella</i>)	400 ml	Antibiograms	994
	Bovine pleuropneumonia (lungsickness)	135 ml	Serotyping of cultures	373
	<i>M. mycoides</i>)		Skin scrapings	678
			Faeces examinations	9 202
			Identification of internal parasites	762
			Identification of external parasites	46
			Mastitis milk examinations	4 847
			Semen	6 172
			Sheath washings	1 347
			Vaginal swabs	1 883
			Aborted foetuses	341
			Haematology	21 510
			Biochemical	34 462
			Toxicological	744
			Bacteriological	19 794
			Virological	12 757
			Protozoological	1 251
			Biological	757
			Histopathological	1 379
			Poultry specimens	2 669
			Trichinella	109
			Smears	8 563
			Ascheim Zondek tests	380
			Total	228 275

Altogether 5 000 ml of leptospirosis antigen was made by the regional veterinary laboratory at Stellenbosch, while in Middelburg (Cape) 1 369 ml of *Actinobacillus seminis* antigen and 275 ml of *Pasteurella haemolytica* antigen were made. The regional veterinary laboratory at Allerton prepared 1 199 ml of complement.

During the year 31 850 doses of different vaccines, with a total value of R327, were destroyed because the expiry dates had been reached or the manufacturer's requirements regarding storage had not been observed.

VETERINARY SERVICES

DIAGNOSTIC SERVICES

In the course of diagnostic work *post mortem* examinations were done by State veterinarians on a total of 5 188 cattle, sheep, goats, pigs, equines, dogs, cats and other animals. They also carried out 20 931 clinical examinations on animals.

State veterinarians of The Division of Veterinary Services performed 2 975 *post mortem* examinations on poultry; 3 304 were done at the Veterinary Research Institute.

The laboratory tests done by the officers of the Division of Veterinary Services are listed in the next column.

SURVEYS

A survey was done to determine the incidence of brucellosis in cattle in the Winter Rainfall Region. The information obtained will be used when the voluntary accreditation scheme for brucellosis-free herds is initiated.

The State Veterinarian at Swellendam conducted a survey on the extent of "draaiderm", during which it was found that more than 1 000 sheep died from this condition during the year.

State veterinarians in the Northern and Eastern Transvaal Region are doing a survey to determine calving percentages. Where these are found to be low the cause will be determined.

A survey to determine the incidence of trichomoniasis in Venda was started. Out of 288 sheath washings examined, 59 were found to be positive.

CLINICAL SERVICES

Veterinary services were once again rendered by State veterinarians to all State-owned herds and flocks; clinical services were rendered to farmers when the official duties of the State veterinarians permitted, especially in the areas where there are no private veterinary practitioners.

During the year the amounts of R21 181 for professional services and R4 644 for travelling expenses were collected by State veterinarians. Vaccines to the value of R10 704 were sold by State veterinary offices. Laboratory fees amounted to R15 430, fees for meat inspection at the export abattoirs to R200 149, fees for keeping animals and birds in quarantine amounted to R99 195 and sundry revenue to R525. The total amount of revenue received by the Division of Veterinary Services was R351 832.

ARTIFICIAL INSEMINATION

The testing of bulls at AI co-operatives and those kept by individual breeders in Natal and the Western Cape was again undertaken by the regional veterinary laboratories at Allerton (for Natal) and at Stellenbosch (for the Western Cape). All other bulls were again tested by the AI and Reproduction Section. The final recommendation for registration or re-registration of all bulls is still made by the AI and Reproduction Section after all results have been made available for analysis by them. In this way 167 bulls were tested during the year.

One of the bulls tested positive for vibriosis after four negative sheath washings. The bull was treated with antibiotics in the sheath and injected with the vibriosis vaccine, after which it reacted negatively and was re-registered.

At present there are 22 (nine more than last year) AI bulls that react positively to the serological test for infectious pustular vaginitis (IPV/IBR). There are 167 bulls of 18 breeds at present at AI co-operatives. Bulls of dairy breeds form 60 per cent of this total.

The total number of doses of semen sold by AI co-operatives during 1975 was approximately 603 000 (1974 - 426 000). With this quantity approximately 6,8 per cent of all calves in the Republic were sired in 1975 (1974 - 6,6 per cent). The number of inseminations done by registered inseminators decreased further to 11 700 (1974 - 16 558) because of the fact that the great majority of farmers now do their own inseminations or make use of non-registered inseminators in their service.

During the year under review the AI and Reproduction Section offered four courses for persons wishing to become registered inseminators. Out of 69 candidates five failed. As was anticipated in the previous report, persons who completed the course at Potchefstroom were examined by the Section and registered if successful. Seven candidates qualified in this way and were registered. Officers of the Section were external examiners on three occasions at the courses at Potchefstroom.

During the coming year the Section anticipates offering courses at Onderstepoort to farmers who wish to inseminate their own animals. The course will last ten days and not three weeks - the duration of the course for inseminators who qualify for registration.

During the year the Section also offered four courses at Onderstepoort for Non-White labourers. Of the 63 candidates 56 passed and can now inseminate their own or their employer's stock. According to reports from farmers they are doing very well.

The Section also offered a course which lasted a week to 12 BSc Agriculture students. All twelve passed the course.

Various courses for farmers who want to inseminate their own stock were held by State veterinarians. At Potchefstroom 12 courses were attended by 210 cattle farmers. Four courses attended by 74 farmers were offered at Glen College of Agriculture during which artificial insemination in cattle and sheep (in brief) was covered. In the Winter Rainfall Region of the Division of Veterinary Services two courses were offered at George and two at Elsenburg College of Agriculture for 54 cattle farmers. Twenty-four cattle farmers attended two courses at Cedara College of Agriculture, and 15 farmers at Middelburg (Cape), 18 at Upington and 12 at Groblersdal completed a course. These farmers can now inseminate their own stock.

SYNCHRONISATION OF OESTRUS IN BEEF CATTLE

Trials conducted at the Veterinary Research Institute with two different preparations showed that Africander cattle had lower conception rates than cross-bred animals or European breeds. A possible reason for this is that, when prostaglandins are used, synchronised Africander cows ovulate sooner than other breeds and should consequently be inseminated earlier than the customary 72 and 96 hours after the second injection.

MEAT HYGIENE

Abattoirs

At present 1 097 abattoirs are on record at the Division of Veterinary Services. Of these 897 are red meat abattoirs, 181 poultry abattoirs and 19 rabbit abattoirs. These abattoirs are distributed among the four provinces as follows: Transvaal 421, Cape 392, Natal 176 and Orange Free State 108. (These figures include all the abattoirs in the Homelands except those that are not in the urban areas of the Transkei.)

During the year under review 40 abattoirs ceased operating for various reasons and their certificates of approval were cancelled: Transvaal 19, Cape 9, Natal 11 and Orange Free State 1.

During the same period certificates of approval were issued to 79 new abattoirs, distributed among the provinces as follows: Transvaal 26, Cape 21, Natal 22 and Orange Free State 10.

An amount of R244 106 was paid to local authorities in the form of subsidies on the salaries of meat inspectors in their service, in accordance with the provisions of section 20(1) of Act 87 of 1967.

Sterilisation installations

At present there are 67 registered sterilisation installations in the Republic. Only one new installation was registered this year.

These installations produce fishmeal, carcase meal, bloodmeal, bonemeal, fish oil and tallow.

At present these installations are inspected once a year by State veterinarians but the intention is to increase the number of annual inspections.

Planning

In accordance with the provisions of section 18 of Act 87 of 1967, the Division of Veterinary Services examined 126 plans and drawings of abattoirs and factories submitted for comment and recommendations. Of these 68 were for new abattoirs and 58 for proposed improvements to existing premises. Among the former there was one for game and one mobile game abattoir.

Under present legislation the erectors of abattoirs are not obliged to submit their plans to the Division for approval before building starts. If plans are submitted after building has started it costs considerably more to make the alterations

needed to ensure that the abattoir will meet the hygienic requirements of the Division. The plans were therefore voluntarily submitted in advance and those concerned were saved considerable expense and at the same time gained an insight into the hygienic requirements of the Division.

Meat imports

South Africa is still importing meat from Rhodesia, Botswana and Swaziland.

Meat exports

There was a considerable increase in the quantity of meat and meat products exported. During 1974/75, 940 632 kg of canned meat products under cover of veterinary certificates were exported, during the year under review 3 492 862 kg were exported in this way. The mass of frozen and chilled beef exported has more than doubled, reaching 381 356 kg. Pork exports have decreased to 700 257 kg in comparison with 3 713 100 kg the previous year.

Towards the end of the year under review there were 12 red meat establishments that complied with the requirements laid down by Great Britain and other EEC countries for meat exported to them.

Meat inspection and control services

The Division is still providing meat inspection services at abattoirs which belong to or are managed by the Abattoir Commission, as well as at the privately owned abattoirs approved as export establishments.

A shortage of staff to render these services still exists, although it is not as acute as before. The position will, however, change radically in the coming year, when the Division will have to assume responsibility for meat inspections at the abattoirs of East London, Bloemfontein, Port Elizabeth and Krugersdorp as well.

Notwithstanding the above-mentioned, progress has been made with the raising of the standards of hygiene at abattoirs and plants under the control of the Division. It was nevertheless necessary, in some cases, to issue orders in terms of section 30 of Act 87 of 1967. Some owners were prosecuted and heavily fined and this encouraged others to carry out the necessary improvements. All prosecutions or other steps taken were in respect of requirements that could be rectified by improved management or at a very low cost.

Where the cost of rectifying the shortcomings was very high, exemption was granted to those concerned provided they applied for it. Such exemption was granted to 33 abattoirs. Other factors taken into account when granting exemption were the rationalisation scheme of the Abattoir Commission, the intention of the owner to build a new abattoir within the near future and the degree of importance from the point of view of

hygiene of the item, for which exemption was applied for.

STOCK INSPECTION SERVICES

The distressing shortage of stock inspectors worsened during the year. The most efficient stock inspectors are all persons aged 50 years or more, and more than 55 per cent of the total number of stock inspectors fall into this age group. It is becoming increasingly difficult to render an effective and functional stock inspection service to the farmer.

ANIMAL HEALTH EXTENSION SERVICE

The volume and effectiveness of extension services rendered to farmers by officers of the Division of Veterinary Services are increasing continually. Apart from the Division's contribution to the training of farmers at agricultural colleges, the compiling of leaflets etcetera, the following extension tasks are also undertaken:

Farmer's days are arranged and addressed, articles are published in local newspapers and agricultural journals, farmers unions and study groups are addressed, radio talks are compiled, short courses on animal diseases (prevention and cure) are held and programmes for vaccination and dosing are drawn up. State veterinarians and stock inspection staff furnish individual farmers with information regarding their own farms and animal disease problems, improved farming methods and the advantages to be gained by taking part in a scheme such as the bovine tuberculosis eradication scheme. This takes place during farm visits, office interviews, by telephone or by letter.

IMPORT AND EXPORT CONTROL

IMPORT CONTROL

Precautions against the introduction of animal diseases from other countries are never relaxed. To this end quarantine facilities were made available by the Division of Veterinary Services at the quarantine stations at Jan Smuts Airport, Durban, Cape Town and Walvis Bay.

As is shown by the table of animals imported for slaughter, farming or other purposes (Table 1 on the next page), there are facilities available for a large variety of animals.

A wide variety of products were also imported on permits issued by the Division.

EXPORT CONTROL

In accordance with the requirements of importing countries, veterinary examinations for export purposes were carried out on the animals listed in Table 2, and certificates were issued.

A large variety of products were likewise certified by officers of the Division.

TABLE 1

Cattle	7 751
Horses	376
Sheep	50
Goats	607
Pigs	6
Dogs	2 527
Cats	892
Poultry	35 784
Birds	61 592
Rabbits	55
Game	6
Zoo animals	115
Tropical fish	612 743
Tropical fish eggs	2 670 000
Reptiles	215
Rodents	1 255
Primates	858

TABLE 2

Cattle	13 685
Equines	438
Sheep	370
Goats	295
Pigs	35
Dogs	1 437
Cats	351
Poultry	1 665 501
Birds	16 850
Wild animals	113
Laboratory animals	8
Reptiles	126
Fish	20
Other marine animals and birds	154

TRAINING

Veterinary Science was again taught by State veterinarians of the Division at all the agricultural colleges.

Several State veterinarians attended a short course on reproduction at Onderstepoort. Chief stock inspectors attended a course on the collection, packing and identification of ticks. The information was in turn transmitted by them to their staff.

The formal in-service training for members of the stock inspectorate staff was continued. During the year 67 officers were trained in 3 courses, which raised the total number trained since 1972 to 455. The service rendered by officers trained in this way improved considerably and much more effective information is given to farmers on vaccines and their use, first aid for animals in emergencies, accurate sampling techniques, the despatching of samples and elementary veterinary practices such as the dehorning of stock, castrations and the tail docking of lambs.

During the year under review the training of senior members of the stock inspectorate staff to do tuberculin tests was started. These officers assist with the testing of cattle under the bovine tuberculosis eradication scheme and are doing extremely well. Two courses have been held and 42 officers have been trained.

LEGISLATION

During the year the following Government notice was published under the Act indicated:

Animal Diseases and Parasites Act, 1956 (Act 13 of 1956) G.N. 1389 of 25 July 1975 - Amendment of Standing Regulations.

No Government notice was published under the *Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967)*.

TECHNICAL RELATIONS WITH OTHER COUNTRIES

LIAISON AND CO-OPERATION WITH AFRICAN COUNTRIES

Eleven scientists from the following African states visited the Veterinary Research Institute during the past year: Botswana, Kenya, Malawi, Rhodesia, Swaziland and Zaire.

The undermentioned African states purchased vaccines direct from Onderstepoort. (Onderstepoort vaccines sold by various firms to neighbouring states are not included.)

	Number of doses
Botswana	216 487
Lesotho	197 678
Malawi	801 590
Mozambique	53
Rhodesia	2 976 941
South-West Africa	1 568 506
Swaziland	81 692
Zambia	5 373 900
	11 216 847

During the same period the Institute received 1 907 specimens from African states for diagnostic purposes.

LIAISON WITH OVERSEAS COUNTRIES

During the year the State veterinary office and laboratory at Skukuza were visited by 22 scientists from overseas countries, five visited the regional veterinary laboratory at Middelburg (Cape) and six the regional veterinary laboratory at Stellenbosch. Thirty-nine scientists from abroad visited the Veterinary Research Institute.

Nine tourists from Switzerland and Australia visited the regional veterinary laboratory at Middelburg, and 207 foreign tourists visited the Institute in organised groups.

TECHNICAL ASSISTANCE AND ADVICE

World Reference Centre (OIE) for bluetongue and horsesickness

Bluetongue

The typing of the 10 virus isolates received from the USA and mentioned in the previous report was finalised by the Veterinary Research Institute. The isolates were identified as Types 10, 11, 13 and 17, of which 17 is a new type. A further two isolates from the same country were also typed as Type 17.

STOCK CENSUS

Region or homeland	Cattle ^x	Sheep		Goats	Horses	Donkeys and mules	Pigs	Fowls	Dogs
		Woolled	Non-woolled						
Winter Rainfall	352 663	3 005 567	1 396 056	371 031	17 630	8 008	227 235	5 672 009	38 757
Eastern Cape and Karoo	936 834	7 594 146	1 474 479	1 237 184	30 838	11 118	78 508	2 851 132	68 504
Transvaal	2 138 273	2 742 599	262 586	138 918	40 903	9 485	255 424	8 903 283	344 203
Natal	1 549 835	987 039	91 733	131 913	28 193	6 025	134 062	11 569 521	65 429
O F S	1 348 723	3 090 806	3 934 433	450 134	39 481	16 251	103 244	852 154	62 740
Highveld	2 194 533	2 799 476	404 247	67 162	59 233	3 752	235 975	3 456 294	134 778
Northern and Eastern									
Transvaal	1 249 669	247 317	175 076	138 851	6 116	12 656	84 344	1 133 478	51 941
Ciskei	158 525	190 866	—	149 367	5 489	793	14 557	129 947	14 635
Bophuthatswana	472 078	—	226 023*	500 302	13 337	46 111	14 137	289 063	22 081
QwaQwa	6 850	4 039	320	9 500	887	43	212	9 225	606
kwaZulu	1 311 415	69 550	119 291	648 031	16 383**	34 548***	21 788	835 808	83 888
Venda	119 587	—	2 549	46 688	5	5 258	9 092	42 816	20 000
Gazankulu	137 888	—	2 529	48 675	2	4 913	5 765	47 141	18 000
Lebowa	500 294	204	108 421	417 567	190	29 286	22 068	308 598	25 516
Transkei	No figures available								
Total	12 477 167	20 731 609	8 197 743	4 355 323	258 687	188 247	1 206 411	36 100 469	951 078

x Please refer to next table for analysis of cattle figures.

* Sheep not divided between woolled and non-woolled.

** Horses and mules together.

*** Donkeys alone.

Horsesickness

Three specimens from Swaziland were positive for horsesickness and of these one has already been typed as Type 5.

Vaccines

The following quantities of vaccine were sold to overseas countries by Onderstepoort:

	Number of doses
Israel	66 000
Seychelles	10 000
	76 000

About 6,6 per cent of the Onderstepoort vaccines were sold direct to other countries, mostly to neighbouring states. This figure must be regarded as an underestimate of the true position, since approved wholesalers were granted permission as from this year to supply Onderstepoort vaccines,

unidentified as such, direct to Botswana, Lesotho and Swaziland.

DISTRIBUTION OF CATTLE

Region or Homeland	White owners		Non-White owners	
	White areas	Non- White areas	White areas	Non- White areas
Winter Rainfall	347 108	-	5 555	-
Eastern Cape				
and Karoo	901 256	-	34 176	1 402
Transvaal	1 946 793	-	191 480	-
Natal	1 267 477	-	252 398	29 960
OFS	1 334 101	-	14 622	-
Highveld	2 108 835	-	82 444	3 254
Northern and Eastern				
Transvaal	1 153 436	-	36 900	59 333
Ciskei	-	-	-	158 525
Bophuthatswana	-	-	-	472 078
Qwa-Qwa	-	-	-	6 850
kwaZulu	-	557	-	1 310 858
Venda	-	-	-	119 587
Gazankulu	-	104	-	137 784
Lebowa	-	764	-	499 530
Transkei		No figures available		
Total	9 059 006	1 425	617 575	2 799 161

8. Agricultural Engineering



This compact ultra-low-volume locust sprayer was developed by Mr F.J.C. Hugo of the Division of Agricultural Engineering. It can be readily mounted on a small truck and the driver can control it from his cabin. In trials it was proved to comply with the high requirements this type of apparatus must satisfy

Agricultural engineering embraces all branches of engineering that relate to agriculture; these may be divided into four main fields, viz:

- Agricultural mechanisation in plant production
- Agricultural mechanisation in animal production
- Water utilisation in agriculture, with the emphasis on irrigation engineering
- Engineering in relation to the conservation of natural resources.

TESTING OF AGRICULTURAL IMPLEMENTS AND EQUIPMENT

The testing of agricultural engineering equipment was again one of the most important activities during the year under review. Commercially available implements and equipment are tested and reports are issued under the trade

names of the products, enabling farmers to select equipment far more judiciously than would otherwise have been possible.

Another advantage of the testing programme is that manufacturers are given considerable assistance with the development of improved implements in South Africa, and with the assessment of imported implements.

During the year a record number of tests on series of implements were completed and the following 6 series of reports were published:

- Agricultural fans (7 units)
- Tined implements (11 units)
- Mounted mowers (cutter bar) (6 units)
- Granular herbicide applicators (4 units)
- A second series of vineyard sprayers (7 units)
- Farm feed mixers (15 units)

This brings the total of completed tests to 18 series. In addition, reports are available on pick-up balers, mounted disc-harrows, disc-ploughs, mouldboard ploughs, single tine subsoilers, cattle massmeters, hammer mills, fertiliser spreaders,

milking machines, a single series on vineyard sprayers and two series on single-kernel planters.

Test programmes at various stages of completion include the following: sprinklers for irrigation, drippers for irrigation, semi-mounted mouldboard ploughs, forage harvesters, rotary disc mowers, herbicide sprayers, and the testing of a second and/or third series of feed mixers, cattle massmeters, trail type disc harrows, single-kernel planters and augers.

A test to determine the capacity of various feed mixers to work molasses into feed mixtures is far advanced.

Taking a series of implements through all the stages of a testing programme, which normally includes the development of suitable testing techniques, laboratory tests, field trials, a consumer survey and the careful compilation of the report, is a long process. It usually takes from 12 to 24 months (or even longer) before the test reports are ready for publication. Where a series of implements has been tested previously and the staff are familiar with the techniques and procedures, the completion of the various stages of the test naturally takes far less time.

All the manufacturers and distributors again gave the programme their whole-hearted co-operation.

AGRICULTURAL MECHANISATION: RESEARCH AND DEVELOPMENT

In addition to the official testing of agricultural implements and equipment with a view to the publication of test reports, a great deal of other research and development was undertaken in connection with mechanisation problems in agriculture.

MECHANISATION PLANNING

Mechanisation and labour represent a very large part of the costs in arable farming and the Division devoted considerable attention to assessing the present mechanisation systems and labour utilisation on farms, principally in the Highveld Region. Current practices were analysed and a simple technique for developing a co-ordinated mechanisation plan for farms was developed.

This technique was presented in the form of two-day courses which were attended by farmers, agricultural extension officers, dealers in agricultural machinery and officials from agricultural co-operatives. The courses are becoming increasingly popular and are yielding good results.

TRACTOR LIAISON COMMITTEE

The Tractor Liaison Committee on which importers and distributors of all 15 makes of tractor currently available in South Africa are represented meets quarterly to discuss matters of common interest.

This liaison committee ensures that the various commercial concerns retain adequate contact with each other and with the Division, and again made consultation and action in connection with several important common issues possible.

Recently the Committee performed the important task of providing practical assistance in solving a serious crisis in connection with tractor tyres. The firms met the tyre manufacturers, the Departments of Commerce and Industries and other concerns and measures were taken to ensure the fastest and most effective solution to the problem.

MECHANICAL HARVESTING OF POTATOES

The investigation to determine to what extent potatoes are damaged by mechanical harvesting and subsequent mechanical sorting and handling, in which specialists in field husbandry from the Transvaal Region and officers of the Potato Control Board are co-operating, was continued.

Clearly some degree of mechanical damage is unavoidable when potato production is mechanised, although the degree of damage can be reduced by using the equipment correctly.

Mechanical damage can be reduced by means such as covering conveyer chain links and sharp points with rubber, keeping the drop height of the tubers as low as possible and not working at a speed of more than 2,5 km/h.

A pamphlet on this matter has been compiled.

MECHANICAL HARVESTING OF GROUNDNUTS

It has been found that conventional augers and similar equipment for grain handling cause considerable damage or are otherwise unsuitable for groundnuts. A bucket elevator was designed, built and evaluated and it clearly has great possibilities.

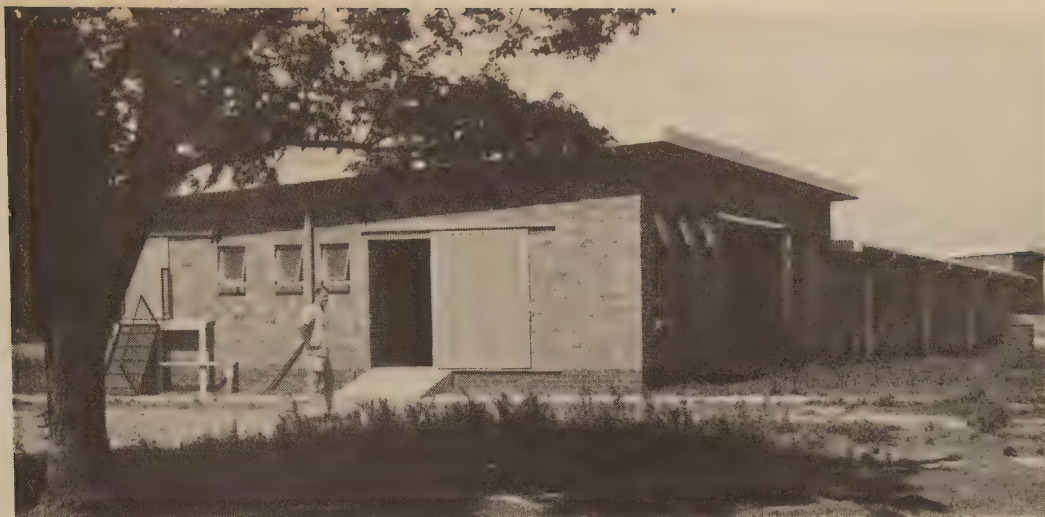
MECHANICAL HARVESTING OF DRY BEANS

The evaluation of mechanical dry bean harvesting processes, which are still relatively unknown in this country, was started. There is every indication that mechanical harvesting has great possibilities provided weed control and other cultivation problems can be ironed out or adjustments can be made. There were no significant crop losses or downgrading of the crop, and 70 labourers could be replaced by 4.

GRAIN DRYING

There is an increasing demand for technical and professional assistance with grain drying. The trials carried out in co-operation with the Maize Control Board and the co-operatives on maize drying at low temperatures in large silos were continued.

The investigation and evaluation of drying installations belonging to farmers were continued. Farmers were also given considerable technical



Staff of the Division of Agricultural Engineering at Potchefstroom erected this building at the College at a cost of R12 000. It is used for research and training in connection with intensive pig housing

assistance and guidance in constructing drying installations and short courses on this subject were started. A publication on standard designs for farm driers is being compiled at present.

MECHANISATION IN TOBACCO CULTIVATION

The Division is co-operating closely with the Tobacco Research Institute on tobacco mechanisation projects. A tobacco chopper was designed and built for use with the simplified techniques where shredded leaves are dried and handled instead of whole leaves.

MECHANICAL DRYING OF KARAKUL PELTS

At the request of the SWA Region a research drier for Karakul pelts was designed. The purpose is to determine parameters for the mechanical drying of the pelts.

PRODUCTION OF HAY AND FEED

The analysis of mechanical systems for making hay and silage was continued and surveys were carried out in Natal and Griqualand East. A report on the efficiency of the new large round baler is being prepared from this data. At this stage this implement appears very promising.

A conventional baler with a bale chute was tested at the Nooitgedacht Research Station and it was shown that this kind of system works very efficiently and produces a significant saving on labour.

TRACTOR POWER AND TRACTION

Investigations have revealed that the efficient use of tractors leaves much to be desired.

The factors which affect the traction of tractors under various working conditions, with ordinary single-drive wheels, dual wheels and four-wheel drive transmission, were studied. An active extension programme was launched to advise farmers on the best practical methods of making optimum use of their tractors.

Modern tractors are designed to operate at fairly high speeds, but South African conditions and traditional practices result in tractors being used at relatively low speeds, which has an adverse effect on efficiency. The growing interest in short courses and demonstrations on tractor use indicates that farmers are becoming increasingly aware of the importance of high performance by tractors.

A highly sophisticated power testing laboratory was designed and is being built in order to make it possible to measure accurately various aspects of tractor performance, such as power take-off power and engine power.

ULTRA-LOW VOLUME SPRAYING EQUIPMENT FOR LOCUST CONTROL

The investigation into the practicability of using ultra-low volume equipment for spraying locusts is continuing in co-operation with the Plant Protection Research Institute. As a result of this research and a short overseas visit by a combined team of engineers and entomologists, a machine

was developed which is mounted on a light delivery vehicle and can easily be controlled by the driver. After repeated testing of the proto-model a robust and compact machine that meets all the requirements was developed.

MECHANICAL HARVESTING OF WINE GRAPES

The Division continued with the testing of mechanical grape harvesters in co-operation with the Oenological and Viticultural Research Institute. The performance of various harvesters had been observed the previous year and during the past year the effect of various harvester parameters on mechanical harvesting and the extent to which various cultivars lend themselves to mechanical harvesting were investigated. Losses on the vine and on the ground were measured, and samples were taken for oenological evaluation. Skin strength, berry-stalk attachment, etc., were determined. Significant differences between cultivars were found.

WINERY EQUIPMENT

Various aspects of wine presses were evaluated, of which the following were the most noteworthy:

- The mechanical properties of a new type of horizontal wine press are being tested, in co-operation with interested concerns, to determine throughput, total run-off at specific pressures and lees quality of the run-off.
- With a view to winery design the throughput and juice recovery of a 600 mm and 780 mm final press were determined.
- In a pilot trial the throughput, juice recovery, electricity and diesel consumption of a thermovinification system at a co-operative winery were established and the running costs of the system calculated. The tests will be continued next pressing season.

FRUIT DEHYDRATION TUNNELS

Considerable research went into determining the efficiency and performance of various dehydration tunnels. Matters such as throughput capacities, drying times, air speeds, atmospheric humidities and power consumption were determined for various types of fruit.

A simulation model of a California-type backflow dehydration tunnel was built to simulate the fluctuating drying conditions in a commercial tunnel. All the important parameters such as air speed and dry and wet bulb temperatures can be simulated accurately in the model and varied at will.

MILKING MACHINE SYSTEMS

The evaluation of spares for milking machines that milking machine firms intend importing was continued as a follow-up to the official testing programme for milking machines. Extension work was continued throughout the year and both

farmers and dealers attended special courses on milking machines and mechanical milking.

REFRIGERATION AND COLD STORAGE OF FRUIT

The Division co-operated with the Fruit and Fruit Technology Research Institute on several related aspects, such as the effect of container design, stacking patterns and refrigeration methods on the rate of refrigeration. In the process a simple apparatus was developed which farmers can use for the direct measurement of humidity in cold stores.

FARM BUILDINGS: RESEARCH AND DEVELOPMENT

As farms become increasingly mechanised to save labour, there is an increasing need for the expert planning and design of farm buildings and related structures and equipment, especially in view of the intensification of livestock farming. During the past year the Division has given attention to cattle fattening systems, dairy establishments, pig housing, small stock housing and cattle dipping systems, and to the related pollution problems.

FATTENING OF LIVESTOCK

Cattle fattening is already widely practised, and interest in fattening sheep is growing. The Division built intensive farming systems for both cattle and sheep and/or developed feedlot complexes in which the most important design factors, viz slope, wind direction, pollution, waste disposal, feed and water supply, sorting of livestock, etc., were taken into account.

SPRAY RACE INSTALLATIONS

The investigation of existing and available spray race installations was continued. A great deal of highly significant information has already been obtained and is collated in the publications being compiled at present. One of the findings enabled the Division's engineers to develop a smaller and more economic dipping tank.

CALF HOUSING

The information obtained in the course of investigations has been used to draw up practical plans and guides, which are in great demand.

VENTILATION AND STOCK HOUSING

It was found that there is a serious need for information on ventilation. The critical importance of the correct design of roofs and ventilation openings is often overlooked, even by good stock farmers. The Division emphasised the matter repeatedly at courses on the subject and at other gatherings and demonstrated ventilation with the aid of models to those interested.

WATER UTILISATION: RESEARCH AND DEVELOPMENT

The activities of the Division with regard to water utilisation covered the following matters:

Research and development, principally on
irrigation equipment and techniques
Testing of irrigation equipment
Planning and design of irrigation systems



This shed for poultry laying-batteries was erected on treated wooden posts. It is inexpensive and very effective



This glasshouse was erected at the Potchefstroom Research Station at a cost of R32 000. It is used for research in connection with oil seeds and other protein-rich seeds. An increasing number of this type of structure is at present being built for research purposes



Horizontal, elevated silos of reinforced concrete are gaining in popularity. This one was erected at a Highveld Research station at a cost of R1 500 and is designed to withstand the shocks of mechanical filling and emptying

Extension and training
Professional auxiliary services

Testing, extension and professional services are discussed under the appropriate headings. The following is a concise report on the other activities. The research and development were aimed at acquiring specialised engineering knowledge of all the most important aspects of irrigation, and of other forms of water utilisation in agriculture, and applying that knowledge for the benefit of the agricultural industry.

The following were the most important matters studied:

FLOOD IRRIGATION AT THE OLIFANTS RIVER SCHEME

Following previous findings and recommendations further tests were carried out. By increasing the unit current (by either increasing the irrigation flow or reducing the bed width) a considerable reduction in supply was obtained without sacrificing distribution efficiency or the moisture requirements of the crop (wine grapes). Savings in the region of 50 per cent were common.

WETLAND DEVELOPMENT IN THE NATAL REGION

Following a survey of the extent of wetlands and the feasibility of utilising them under certain conditions, a guide was compiled for farming wetlands in the Natal Region. It incorporates the important aspects of drainage and irrigation. An unpublished report on this subject is available.

EVALUATION OF SPRINKLER IRRIGATION

Surveys were carried out in the Paarl-Wellington area. Where wine-grapes are

irrigated twice or three times a season the design standards appear to be correct. With more intensive irrigation, such as in the case of table grapes, where light irrigation is applied more frequently, it was possible to make significant improvements to most systems. The surveys therefore provided the extension officers with useful information on irrigation scheduling.

MECHANISED SPRINKLER IRRIGATION SYSTEMS

Surveys were made and field tests carried out. The findings indicate that the systems work efficiently but are only economically justifiable if they are fully utilised, i.e. for more than one crop a year.

HYDROELECTRIC POWER GENERATION

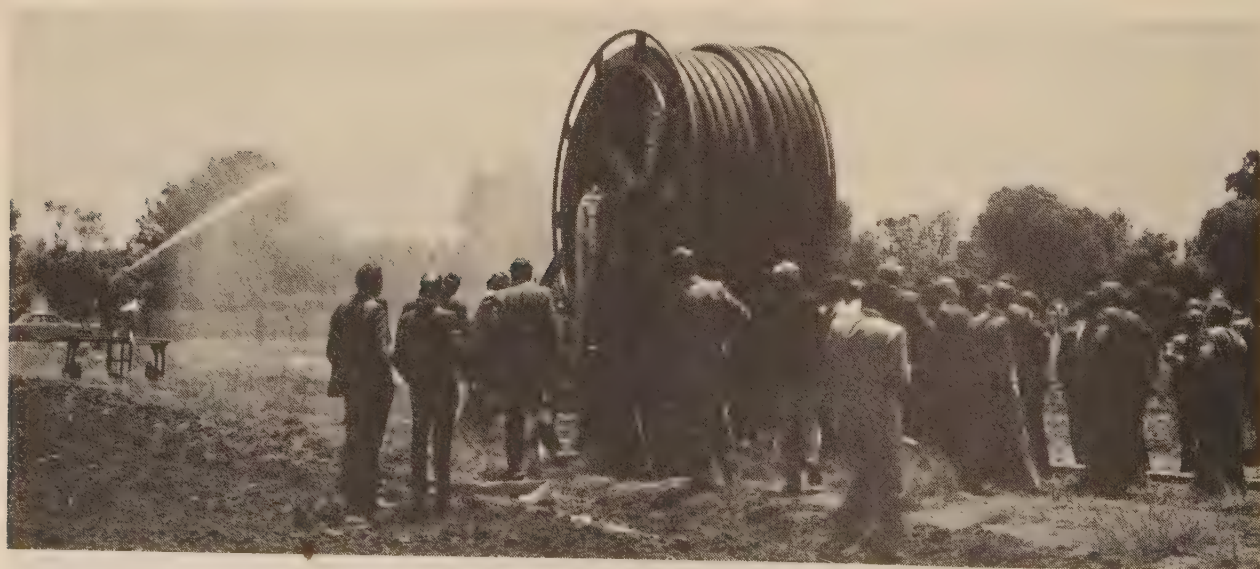
The popularity of the relatively cheap method of power generation developed by the Division, where a centrifugal pump is coupled in reverse and used as a turbine, is still increasing. An electrical governor developed during the past year will make construction and use by the farmer considerably easier.

IRRIGATION EQUIPMENT

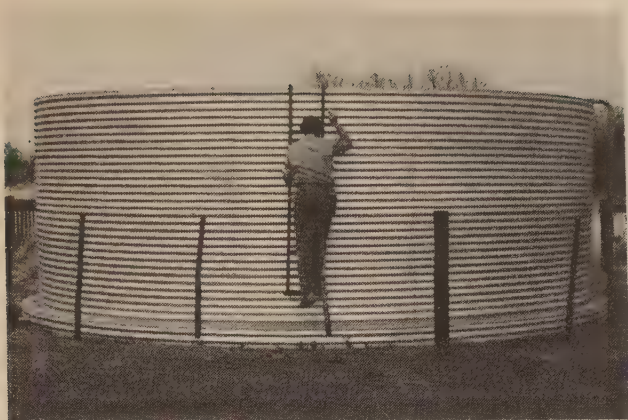
Various types of irrigation equipment were developed and/or improved.

Automatic irrigation system

Twelve tensiometers were linked to a twelve-channel automatic irrigation system in such a way that irrigation of any channel takes place



Farmers are becoming increasingly interested in mechanized irrigation systems. Here a "creeping sprayer" is demonstrated at the terrain of the Division at Silverton. On the far left is a cannon sprayer mounted on a small cart and fed by a 250 m-long pipe that can be rolled up. The large pulley rolls the pipe up and pulls the cart at a predetermined velocity.



Round, corrugated iron storage-dams up to 2,4 m deep are at present being erected on remote farms where the use of other building material is impractical. They are approximately twice as deep as ordinary storage-dams and special precautions must be taken with their building

only when the moisture content of the soil irrigated by that channel drops below a predetermined level. The complete system was used in co-operation with the SSFRI during the 1975/76 summer season in a lysimeter irrigation trial and it functioned perfectly.

Testing of pumps

After a survey of irrigation equipment it was decided to test pumps. A special laboratory had to be constructed for this purpose. There are about 500 types of pump on the South African market and it was decided to confine the first stage of the test to about 50 centrifugal pumps with 50 to 100 mm outlets, using no more than 30 kW. The preliminary findings indicate that these tests are supplying useful information with a view to accurate design.

PLANNING AND DESIGN OF IRRIGATION SYSTEMS

Planning naturally cannot be undertaken for individual farmers, but designs by dealers are evaluated and farmers advised accordingly. Several schemes were planned for the State, however.

GOVERNMENT IRRIGATION SCHEMES

The following Government irrigation schemes received attention:

Vanderkloof Dam: Detailed planning was carried out at farm level. The Department of Agricultural Credit and Land Tenure was given information on soil preparation and earth canals for the farms that fall under the scheme. A cost study was carried out which indicates that the most suitable method of

irrigating in this area is some type of sprinkler system.

Fish River area: Overall planning of the area was carried out in co-operation with the Soil and Irrigation Research Institute, with the emphasis on water supply, drainage, and farm boundaries as affected by drainage.

With the aid of surveys and the available information, cost advantage studies were carried out to determine the economics and suitability of irrigation development in the Bushmans River, Venterstad, and Eerste River areas.

As a result of the abundant rains of the past few seasons, and consequent waterlogged conditions of irrigated lands, the brack problem has become increasingly serious. During the past year 61 internal drainage systems in the Vaalharts, Douglas, Riet River and Upington areas were surveyed and designed, and specifications were drawn up. The value of each system will exceed R3 000.

AGRICULTURAL RESOURCE PROTECTION

The main contribution of the Division of Agricultural Engineering to the Department's agricultural resource protection campaign was the following:

- Run-off control planning in co-operation with the regional staff concerned;
- the construction of major soil conservation works in badly eroded and/of vulnerable areas;
- soil conservation research and development; and
- professional guidance on soil conservation engineering to the Division of Soil Protection and regional staff entrusted with the design of soil conservation works.

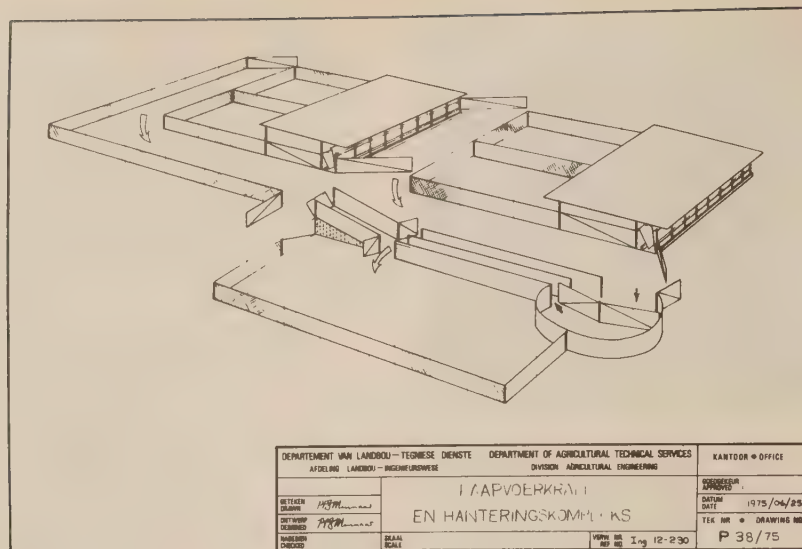
A few of the most important activities of the past year are discussed in some detail below.

RUN-OFF CONTROL PLANNING IN THE REGIONS

The results obtained with the run-off control planning programmes, which are generally directed by regional engineers, have in many cases exceeded all expectations, especially as regards the co-operation received from farmers. In large parts of the country farmers are past the stage where they require convincing. There are now long waiting lists of farmers requiring technical assistance and guidance in surveying and designing planned works. The most important progress and findings are the following:

KAROO REGION

The run-off control planning reports for the Grassridge Dam catchment have been completed. The planned area covers some 483 000 ha. The works planned include 40 large key conservation works and 600 major farmers' works. The estimated



Various plans for buildings and handling kraals for sheep such as this are developed by the Division of Agricultural Engineering. The plans are available from the Division

cost of these conservation works amounts to over R2,5 million. The Brakspruit catchment has been planned. It will cover an area of 360 000 ha.

ORANGE FREE STATE REGION

Run-off control planning of the Kornetspruit and Grysopspruit catchments, which have a total area of about 140 000 ha, has been completed. Fifty-eight State works for this area were completed.

NATAL REGION

The programme aimed at protecting cultivated lands is progressing well. During the past year 570 contour systems were completed or planned. They will protect about 5 000 ha of lands. An additional 48 waterways were also designed.

TRANSVAAL REGION

Of the 19 field husbandry target areas of the Region, 6 were planned, with a total area of about 170 000 ha, about 70 per cent of which consists of cultivated lands. Several subcatchments were planned on an *ad hoc* basis where roads were causing run-off problems or where flood waters were doing serious damage.

HIGHVELD REGION

The run-off control planning of 7 preferential development areas, with a total area of 105 000 ha, was completed. At least 500 waterways for the safe dispersion of flood waters from lands will have to be built. In addition over 40 individual farms are planned in this way per month. In general the farmers accept these plans and carry them out conscientiously.

SOIL CONSERVATION RESEARCH

Research and development on soil conservation is undertaken not only by the research team at Aliwal North but also by several engineers, co-operating with members of the regional staff who are interested.

The following are a few of the most important achievements:

SOIL CONSERVATION RESEARCH TEAM AT ALI WAL NORTH

This team is working on several registered research projects and a number of pilot trials. The work is aimed mainly at developing simple and cheap, but effective, measures and structures for the reclamation and conservation of badly eroded and vulnerable soils.

Most of the trial sites are situated in real problem areas where reclamation and conservation are generally extremely difficult and expensive and often uneconomic.

The year under review was characterised by an exceptionally high rainfall in the trial areas. On the one hand this had a very good effect on the plant establishment programme in certain parts, but on the other hand the unaccustomed floods which accompanied the high rainfall subjected some of the trial work to very severe tests. As a result valuable information was obtained.

The following are a few noteworthy findings and recommendations on soil conservation works and measures that have emerged from the various projects:

Common reed again showed that it is very resistant to washing away once it is well established.

Secondary structures, which help to deposit

sediment over great distances in waterways and on which reed can be established, fulfil an important function in conservation work.

The information of the past year again showed that bare patches and sparse veld can be effectively reclaimed by means of a grass cover.

The floods at the pole jacks were far worse than usual, but even in these circumstances the results were very satisfactory in general. A reinforced concrete pole jack, with poles 3 m in length, was designed and made; it will be able to withstand worse floods than the treated pole jacks.

When sites above soil conservation structures received the necessary care there was a considerable improvement in the stabilisation and in the sediment slopes of the sites in question. This tendency to continuous improvement in sediment slopes is so important that it will be included in the formula for the prediction curve for sediment slopes in a guide.

When information on sediment slopes collected in many localities was processed, new facts came to light which will be included in related publications.

WINTER RAINFALL COMPLEX

With the aid of a computer programme rainfall intensity curves were plotted for 46 weather stations in the Winter Rainfall Region.

Surveys revealed that, in the light of the latest knowledge of soils, it would be beneficial to modify the contour espacements for certain soil associations in and around Caledon. These investigations are continuing. There are indications that it will be possible to determine contour espacements more scientifically in the near future, taking the various soil associations into account.

Surveys of existing concrete waterways were carried out in contour systems in the Swartland to evaluate their efficiency. The findings are contained in an unpublished report.

EASTERN CAPE REGION

Attention was given to the problem of mechanising cultural practices in pineapple farming on sloping lands. It appears to be possible to design a semi-parallel contour system which prevents erosion without hampering mechanisation too much.

NATAL REGION

Mechanical tests on soil samples from selected diagnostic horizons have led to a suitability rating of these soils for the construction of impervious earth dams. A report has been compiled.

Owing to the complexity and interaction of the causative factors in the erosion process, the development of an erosion simulation model has been initiated. The objectives are to update data used for hydraulic designs, to determine research and extension priorities, and to motivate farmers and Departmental staff and to exercise stricter control over erosion hazards. Where possible, use will be made of computer programmes.

HIGHVELD REGION

Surveys were carried out on unconventional tillage methods where positive results were obtained with the reduction of wind and water erosion. These methods will be included in the Summer Grain Centre's programme on cultivation research. Certain planters, which produced promising results in stubble lands and quick, will be tested in the course of this programme.

SOIL CONSERVATION WORKS
CONSTRUCTED WITH
GOVERNMENT MACHINERY

The design and construction of key soil conservation works in badly eroded or vulnerable soils are undertaken by the Subdivision of Soil Conservation Works at Aliwal North. Key soil conservation works are major works considered necessary for the stabilisation of water course soils together with surrounding areas. Special construction machinery, equipment and manpower, which farmers do not generally have, are required.

The following table reflects the progress made with construction work of this kind:

Year	New works completed	Value of works (R)	Number of works repaired	Value of re-paired works (R)
1975/76	11	614 599	20	166 882
1974/75	17	463 137	25	217 830
1973/74	8	451 529	15	85 300
1972/73	3	765 759	17	149 317
1971/72	9	401 071	9	115 979

Work on survey investigations and designs can be summarised as follows:

Surveys for the planning of State works were carried out in the four catchments, viz Slikspruit, Sandspruit, Oslaagte and Theewaterspruit.

Designs for 20 State and other major conservation works were completed, with the necessary plans and specifications.

The diamond drilling unit completed foundation investigations in the Slikspruit, Oslaagte, Theewaterspruit and Opkoms catchments.

The building materials laboratory has an essential function to perform in raising the quality of construction works to the required scientific standards. It completed the following tasks:

Soil tests	62
Sand tests for concrete	9
Design of concrete mixtures	2
Determinations of compressive strength of concrete test blocks	222
Soil grading analyses	19



A larger conservation work erected by the Government in a badly eroded flood plain

FREE STATE REGION

During the year under review inspections were carried out and reports compiled on the condition of 14 existing State works. Recommendations were made in connection with the importance of maintenance and follow-up work to ensure that these works will remain effective in future. Surveys were carried out and plans and specifications drawn up for 7 major conservation works.

PROFESSIONAL AND TECHNICAL SERVICES

The professional and technical services rendered by the staff of the Division to the various departments and other Government bodies cover virtually all the engineering aspects of agricultural mechanisation, instrumentation, buildings and structures, soil and water utilisation and courses offered at agricultural colleges.

This is naturally the main function of the professional and technical services section, and it is also one of the most important functions of the engineering staff in the Regions. Other sections also have to perform this type of duty, because of their specialised knowledge.

A summary of a few of the most important tasks performed will give an indication of the nature and scope of this service, which is expanding every year.

BULK STORAGE OF GRAIN

The Division acts as technical adviser to the Grain Silo Committee and the Land Bank in terms of the loan scheme for the erection of bulk storage installations. Two engineers are working full time on this project. Their work entails the appraisal of new plans and submissions in respect of serviceability, cost and method of execution, and the certification of demands by contractors for loan funds.

During the year under review 14 projects were completed; these will provide a storage capacity of $660 \times 10^3 \text{ m}^3$ at a cost of R13 million.

Twenty-nine grain silo complexes, which will provide a storage capacity of $1\,560 \times 10^3 \text{ m}^3$ at an estimated cost of R37 million, are under construction. A further 15, which will cost around R19 million, are at the planning stage.

CONTROLLED ENVIRONMENT SUBSECTION

During the year the subsection concerned with controlled environment studies successfully performed a number of tasks in an endeavour to maintain the lead that has been gained during the past few years in the field of precision controlled, mechanically cooled and electrically heated equipment, together with the design and construction of the conventional type of glasshouse, with all associated problems, such as the provision of an electric power supply, standby electric power supply, control systems and hail protection.

This was a year during which great strides were made, and a number of firsts were achieved in both the more sophisticated controlled environment for purposes of research, and the less complicated but extremely important protected cultivation houses which play an extensive part in commercial pot plant, flower and vegetable production.

The latest growth cabinets, designed and built in the Republic, have proved extremely successful, and as a result many of their features have been incorporated in the latest product by overseas manufacturers.

Progress has indeed been so great that the South African manufacturers are at present seeking markets with a view to exporting the cabinets, which are in many ways superior to the overseas product.

Still in the research field, specific temperature control between 18 °C and 23 °C to the extremely fine tolerance of $\pm 1,0$ °C was achieved for the first time in a glasshouse without any shading. This is indeed a great step forward.

For the first time in South Africa an extremely sophisticated quarantine glasshouse and laboratory complex and the associated equipment were designed for the purpose of creating conditions for research on dangerous plant diseases. This requires double glass walls and the sterilisation of all waste matter or equipment removed from the area, and the decontamination of the researchers before they leave the laboratories. The construction of the glasshouse will start in the near future.

Protected cultivation has now become almost a household word in the plant production field and, as the name implies, basically involves a covered structure for the protection of plant life from all the extremes normally experienced in nature. Great advances in this field were made during the past year.

Some of these improvements are:

- The exclusive use of aluminium, using the alloy B51S (which is approximately equivalent to mild steel in ultimate tensile strength) to eliminate normal maintenance. This is far cheaper over a period of 15 years.
- A curved roof structure spanning bays 12 m wide instead of the 6 m span employed in the past, which may be used in a multi-bay structure to cover large areas.
- The use of shade cloth instead of wood wool mats to atomise the water used in the evaporative cooling systems, together with higher pressure pump and spray nozzle equipment to facilitate more even and improved atomisation of water.
- The installation of an improved settling pit with strainer on the water return flow channels.
- More sophisticated commercial-house temperature control systems with the use of an aspirated anti-solar-radiation cage to house the temperature sensors.

Apart from all the Departmental glasshouses completed during the year, the following are some of the other tasks undertaken.

- With funds provided by the Deciduous Fruit Board, the construction of a new glasshouse with mechanical cooling and under-floor electric heating was completed and commissioned at the Department's Quarantine Station at Stellenbosch.
- With funds provided by the Citrus Exchange, one new mechanically cooled and electrically heated glasshouse was completed for the citrus budwood registration and variety improvement programme at the Citrus and Subtropical Fruit Research Institute, Nelspruit.
- The conversion of one existing evaporation-cooled glasshouse to a precision controlled, mechanically cooled, electrically heated virology unit with ten compartments was completed and the unit was commissioned at the Olko Laboratories at Roodeplaas, with the aid of funds provided by the Potato Board for research on potato diseases.
- Four glass-covered evaporation-cooled commercial glasshouses, based on the Division's designs, were completed for the Department of Public Works for its own plant production at four different centres.
- A similar one was completed for the Botanical Gardens at Nelspruit.

EXPERIMENTAL FARM DEVELOPMENT AND AGRICULTURAL RESEARCH

Departmental research stations are calling on the Division to an increasing extent for professional and technical engineering services required for the execution of their research projects. The tasks performed cover a variety of aspects of agricultural engineering, farm buildings, and soil and water utilisation; not only were plans and specifications drawn up but in many cases the construction was also supervised.

The following are a few examples:

Purchase of agricultural implements: specifications were drawn up and assistance given with the purchase of about 250 different items with a total value of over R300 000.

An engineer of the Division is giving full-time assistance to Onderstepoort and the Tobacco Research Institute with research projects such as meat drying units, refrigeration plants and the bulk curing of tobacco.

Farm buildings and structures for the housing of animals, implements, etc., to the value of several hundred thousand rands were designed for Departmental bodies and assistance was given with their construction. The structures include workshops, several buildings for the housing of livestock (some of an experimental type), pit silos, cloakrooms, stores and laboratories. In the Winter Rainfall Complex, for instance, where the biggest concentration of buildings of this type is found, the local engineering section assisted with 21 structures. In the Free State assistance was given with 6



A typical unprotected, sparsely-covered gully in the Upper Orange River catchment area. The picture was taken from a conservation structure downstream

The same gully two years later: it was withdrawn from grazing and the denuded parts were planted with common reed. Usually common reed will cover the bottom of such a gully within one season, but it is resistant to severe floods only after two seasons and can only then be utilised for grazing



structures and in the Highveld Region buildings to the value of over R200 000 were erected.

WATER UTILISATION

Plans and specifications were drawn up for a number of irrigation, stock watering and drainage schemes connected with research projects.

Several special implements and types of equipment required for research projects were developed and/or made upon request. A few examples are an "electronic leaf" for the Tygerhoek Experimental Farm, a tilting table for sheep, a mechanical loader for an agricultural tractor, a constant flow valve, etc.

AGRICULTURAL ENGINEERING EXTENSION

DIPLOMA STUDENTS

The teaching of agricultural engineering subjects to diploma students at agricultural colleges is becoming increasingly important as mechanisation gains ground in agriculture. Considerable progress has already been made in the compiling of uniform basic lectures on all these agricultural engineering subjects and it is estimated that these lectures will be ready to go to press early this year.

GENERAL INFORMATION SERVICE

It is understandable that an increase in the demand for information should go hand in hand with progress in the testing of implements and equipment, and research into and the development of various aspects of agricultural engineering.

Interested persons are kept informed, by means of the radio and other news media, of the activities of the Division and the publications available. On the one hand this results in visits and written enquiries to the Division and the regional engineering offices, and on the other hand in requests for short courses, lectures and demonstrations on subjects of immediate interest.

The increase has been such that several officers who used to do research only are now spending over 50 per cent of their time on extension work.

PUBLICATIONS

The demand for publications has remained steady at about 5 000 a month.

In addition to announcements about publications over "Calling All Farmers", lists of available publications are distributed to interested persons on suitable occasions. Most enquiries about publications arise from announcements over the agricultural radio programmes.

SHORT COURSES, LECTURES AND DEMONSTRATIONS

Numerous short courses, demonstrations and lectures were given, not only to groups of farmers but also to agricultural extension officers or persons whose work involves extension. The groups formed for training in some form or other include the following:

- In co-operation with the Department of Water Affairs and the Soil and Irrigation Research Institute, the training of sales representatives from the Sprinkler Irrigation Association of SA (which also does the designs) was continued by means of 4-week courses on irrigation. The aim is to train all the representatives (about 450) in due course.
- Several groups of sales representatives for agricultural implements attended short courses in mechanisation planning.
- Groups of members of co-operatives entrusted with extension and/or design received training in the mechanical handling of groundnuts and grain and were also given training in connection with drying equipment for these products.
- The senior diploma students of the Potchefstroom College of Agriculture paid their usual one-day visit to the Division.
- Several groups of learner technicians of the Department who are engaged in formal training attended 20 lectures/demonstrations on agricultural mechanisation at the Division.

JIFFY COURSES

A series of one-day courses has been started at the Division. The idea is for specialists in various fields to present one-day courses monthly in order to bring farmers and other interested persons into contact with the specialists concerned and create a channel for disseminating information. Courses on 7 topics, viz mechanisation planning, tractor performance, soil cultivation implements, milking machines and dairy farm facilities, hammer mills and feed mixers, irrigation scheduling and sprinkler irrigation were held during March and April. The response was so favourable that it was decided to increase the subjects to 17 and hold at least 8 to 10 series of courses during the year under review.

INDIVIDUAL EXTENSION

Except where provided by members of staff stationed in the Regions, individual extension is confined to visitors to the offices of the Division. These visitors generally have pressing problems which they want to discuss with experts.

FOOD EXPO 76

The Division's participation in the Food Expo 76 in May was geared to extension. The emphasis fell on the results of tests on agricultural

implements.

The 18 series of implements for which test results have already been published (in all over 200 units) were exhibited.

This was the first exhibition of its kind, where all the most important implements in the various series for which test reports are available could be seen together, with the officers who carry out the tests at hand to provide information in person.

The stock housing exhibits in particular

aroused a great deal of interest. Since efficient ventilation is of decisive importance where animals are housed in buildings, and the Division has done a considerable amount of research on this matter, the principles and methods of ventilation were illustrated by working models.

Anyone interested in dairy housing, particularly under minimum or zero grazing systems, was able to see a concrete illustration of the most important principles of such installations.

9. Additional Services

PLANT AND SEED CONTROL

VARIETY CONTROL

VARIETAL LIST

Except on the authority of the Minister propagating material of kinds declared under the Seeds Act may not be imported or placed on the market unless the name of the variety in question has been included in the varietal list. A variety is only included in the varietal list if it is distinguishable from existing varieties of the same kind, and appears homogeneous and stable.

Every variety must be identified by its own denomination, which must be different from the denominations of other varieties of the same kind.

This means that all new varieties of the types in question must be examined on the basis of the prescribed requirements for recognition. As soon as the propagating material of recognised varieties reaches the trade, the variety trueness and purity is checked in terms of regulations that make the correct labelling of propagating material compulsory.

The practical application of variety control includes the following:

- The reception of applications for the registration of new cultivars, the reception of the planting material and its distribution to various testing centres for the determination of distinctiveness, homogeneity and stability.
- The processing and evaluation of the results obtained from the various testing centres with a view to determining whether the cultivars in question comply with all the requirements for recognition and, if they do, arranging for their inclusion in the varietal list.
- Check tests on seed that reaches the trade, whether it is of certified, imported or uncertified origin, in order to determine its purity and variety trueness.
- Variety description, including photographs and colour slides - a necessary and important aid to the identification of varieties.

Inclusion of new varieties in the varietal list

The following table shows the kinds and the number of varieties of each kind for which applications for inclusion in the varietal list were received:

Kinds	Number of varieties			Total
	Official	Private	Bred overseas	
Maize	-	10	7	17
Tomatoes	2	-	9	11
Cabbage	-	-	9	9
Cotton	5	-	2	7
Beans	-	-	6	6
Beetroot	-	-	4	4
Onions	1	-	2	3
Cucumbers	-	-	3	3
Watermelons	-	-	3	3
Grain sorghum	-	1	1	2
Tall fescue	-	-	2	2
Sweetcorn	-	-	2	2
Gem-squashes	-	-	2	2
Peas	-	-	1	1
Dallis grass	1	-	-	1
Castor beans	-	-	1	1
Total 1975/76	9	11	54	74
Total 1974/75	3	22	41	66
Total 1973/74	3	42	51	96
Total 1972/73	8	44	21	73

The following table shows the kinds and number of varieties of each kind included in the varietal list:

Kinds	Number of cultivars included in the varietal list
Maize	14
Tomatoes	11
Grain sorghum	8
Cabbage	7
Dwarf beans	5
Cucumbers	4
Soya-beans	3
Watermelons	3
Lupins	2
Sweetcorn	2
Gem-squashes	1
Carrots	1
Peas	1
Onions	1
Kale	1
Rough cocksfoot	1
Total 1975/76	65
Total 1974/75	92
Total 1973/74	81
Total 1972/73	60

DESCRIPTION OF VARIETIES

This is an integral part of variety control. Authentic specimens of all new varieties are placed in long-term storage to provide material for comparison for future trueness tests.

CONTROL TESTS FOR VARIETY TRUENESS AND PURITY

- 5 075 samples of 57 kinds from imported and

certified seed lots as well as lots circulating in the trade were grown at the Division's experimental plots for the determination of variety trueness and purity. This was about 400 samples fewer than during the previous year.

- (b) Most of the samples tested were of the following kinds: maize, potatoes, beans, tomatoes, cabbage, grain sorghum, peas, carrots, forage sorghums and sunflowers.
- (c) In cases where the samples did not comply with the variety requirements the owners were informed so that they could withdraw the seed lots in question from the trade.

SERVICE FOR TESTING VARIETY TRUENESS AND PURITY

In view of the existence of this service the sellers of seed of the kinds in question, namely tomatoes, cabbage and cauliflower, have no excuse for selling seed whose variety trueness is unknown. However, only limited use is made of this facility.

PLANT BREEDERS' RIGHTS

The Plant Breeders' Rights Act (Act 22 of 1964), as amended, determines that any person who has an interest in a new plant which originated in the Republic or in a country with which a reciprocal agreement has been entered into in terms of the Act, can protect his rights with regard to such plant by having recourse to the Act.

- The holder of plant breeders' rights enjoys -
- (a) the sole right to sell propagating material for a certain number of years; and
 - (b) the right to collect royalties from persons to whom licences have been granted for the sale of such material after the expiry of the period of sole right or after the granting of final plant breeders' rights.

The Act applies to any kind of plant which originated in the Republic, and in the case of a reciprocal agreement, to the kinds of plants for which provision was made in the agreement. Plant breeders' rights may be granted in respect of new varieties, provided such varieties are distinguishable from existing varieties of the same kind and are homogeneous and stable.

A reciprocal plant breeders' rights agreement relating to a number of seed-bearing and vegetatively propagated kinds has been entered into by the USA and South Africa. See Government Notices 2021 of 24 October 1975 and 2290 of 5 December 1975.

A new Plant Breeders' Rights Act (Act 15 of 1976) was passed during the 1976 Parliamentary Session. This Act, which is expected to come into operation later in 1976, makes provision for the terms of the *Convention for the Protection of New Plant Varieties, 1961*, with a view to South Africa's intended application for membership of the *Union for the Protection of New Plant Varieties (UPOV)*.

Applications for plant breeders' rights in respect of new varieties of the following kinds were

received: Roses (3), groundnuts (2) and sunflowers (1). Plant breeders' rights have so far been granted in respect of the following kinds and new varieties (in brackets):

Maize (6), tomatoes (6), soya-beans (3), dwarf beans (2), peaches (2), lupins (2), grapes (1), plums (1), aloes (1) and triticale (1).

BREEDERS' PLANTING MATERIAL

The purification and maintenance of varieties in order to obtain propagating material of a high genetic quality for use in the production of certified material was continued in co-operation with officers from various Departmental bodies.

SEED-PROPAGATED KINDS

Maize

Purification of the in-bred strains used for the production of public (SA) hybrids is continuing. In some cases, where stability has already been achieved, combination trials are being carried out.

Japanese radish

Seed of the new Nooitgedacht selection was multiplied. A plant selection was carried out at Sakurajima and is being multiplied.

Cattle melons (makataan)

Two outstanding strains were multiplied and evaluated with a view to the possibility of commercial introduction.

Beans

The scheme for the production of bacteria-free seed is making good progress. A glasshouse multiplication was completed and this seed was multiplied on the Lowveld under strict supervision during the winter months of 1976.

Lupins

About 126 000 kg of Stevens breeders' seed was grown.

Vegetables

The Horticultural Research Institute made the following quantities of breeders' seed available:

Kinds	Variety	Mass
Beetroot	Detroit dark red	25 kg
Beans	Wintergreen	380 kg
Beans	Witsa	150 kg

Grasses

The following quantities (kg) were produced:

Kinds	Variety	Mass
Rye grass	Midmar	311 kg
Dallis grass	Pacedara	75 kg

KINDS PROPAGATED BY VEGETATIVE MEANS

Foundation seed potato production

There are two successive stages in the multiplication of virus-free foundation seed potatoes at Sabie, namely the entry phase and the production phase.

The following varieties were in the entry phase: Sabie, R100, Cedara, Sackfiller, Pentland Dell and No. 155.

The following quantities of foundation seed potatoes were obtained from the production phase, which covered an area of 5,75 ha (7,15 ha: 1974/75) (1974/75 figures in brackets):

Variety	Mass (30 kg units)
Up-to-Date	1 813 (3 899)
BP1	1 320 (1 147)
Van der Plank	441 (392)
King George	200 (298)
Late Harvest	266 (Nil)
Koos Smit	100 (Nil)
Cedara	Nil
Total	4 140 (5 894)

Unprecedented wet conditions caused serious losses as a result of rotting.

PLANT INTRODUCTION AND GERM PLASM

It is the official policy that all imports and exports of samples of plant propagating material undertaken on behalf of Departmental bodies should be handled by the Division of Plant and Seed Control.

The significant increase in the number of samples handled over the past few years continued, as the accompanying table shows:

	1975/76	1974/75	1973/74	1972/73
Number of samples exported	4 707	4 129	1 969	1 222
Number of samples imported for local researchers	4 159	3 205	2 105	1 143
Number of samples imported for rust nurseries	8 922	8 983	9 019	5 472
Total handled	17 788	16 317	13 093	7 837

A plant collecting trip to SWA and the Namib desert was undertaken in co-operation with the Botanical Research Institute. The finds included seed of an indigenous *Nicotiana africana*, which was made available to the Tobacco Research Institute for evaluation.

All data on germ plasm is now stored on computer tape and the addition, withdrawal and tracing of samples is therefore much faster.

There are about 6 000 seed samples in the germ plasm bank.

Particulars of about 1 000 citrus varieties which are being maintained in an orchard by the

Citrus and Subtropical Fruit Research Institute were recorded.

DOMESTIC PLANT AND SEED SERVICES

The Plant Improvement Act, 1976 (Act 53 of 1976), was passed during the 1976 Parliamentary Session. This Act replaces the Seeds Act, 1961 (Act 28 of 1961), and makes provision for quality control over vegetatively propagated material as well as seed.

The new Act requires that packers of seed register as well in future. The registration of nurseries now falls under the new Act instead of under the Agricultural Pests Act. This Act is expected to come into operation before the end of 1976.

CONTROL OVER THE SEED TRADE

Registration of sellers and cleaners of seed

Registered sellers and cleaners of seed now number 343 and 70 respectively - a total of 413 as against 414 the previous year.

The registered sellers and cleaners of seed are distributed as follows over the four provinces:

	Transvaal	Cape	Natal	OFS	Total
Cleaners	34	18	9	9	70
Sellers	135	123	52	33	343
Total	169	141	61	42	413

Control over the cleansing and sale of seed

There are 972 seed distribution points to be visited, and 2 700 inspections were carried out for the purposes of the Seeds Act. This is an increase of 402 over the previous year. The number of seed samples taken for the testing of germination, physical purity, weed seed content and/or variety trueness and purity was 2 702 (or 32,8 per cent more than during the previous year).

The following table indicates the kinds which showed the most quality defects:

Defects	Kinds
Germination too low	Leek, garden beet, peppers, carrots, soya-beans, lettuce, lucerne, peas, sorghum, cow peas
Purity too low	Teff
Too much weed seed	Teff
Variety trueness unsatisfactory	Onion, pumpkins and squashes, radishes (garden)

Advertisements in magazines were watched and 20 persons selling seed without being registered as sellers of seed were traced.

Twelve different types of offence, relating mainly to the sale of seed, can be identified.

Sealing lucerne seed

The following quantities of lucerne seed were approved and sealed after having been found to be free of dodder and to comply with the requirements for purity and germination:

Place where approved	Mass of seed approved and sealed (kg)	
	1975/76	1974/75
Oudtshoorn/Ladismith	857 900	495 600
Upington	39 200	35 425
Johannesburg	54 588	21 600
	951 688	552 625

The quantity sealed virtually doubled in comparison with the previous year.

Control over the quality of imported seed

In all 2 234 samples of imported seed (as against 1 906 the previous year) were taken in order to determine whether they complied with the prescribed import requirements.

Judging from the number of samples taken, Durban, Cape Town, Pretoria and Bethal would appear to be the most important import points for seed.

The following table indicates the number of seed lots that did not comply with the import requirements, for various reasons, and the names of the kinds most frequently involved:

Defect	Number of lots	Kinds most frequently involved
Germination too low	22	Rhodes grass, forage sorghum, turnips, carrots
Physical purity too low	25	Bulb canary grass, beetroot, Swiss chard, parsley
Contains prohibited weed seed	2	White clover, endives

1,07 per cent of all seeds, calculated on the basis of mass, did not comply with the import requirements, for one reason or another.

ANALYSIS, EXAMINATION AND TESTING OF SEED

The Division renders an invaluable service in connection with control over the seed trade, seed certification, seed exporting and research on seed in that its Seed Testing Station tests, analyses and examines seed samples for purity, germination, moisture content, weed content and other properties related to seed quality.

The table at the top of the next page shows the number of seed samples of field crop, horticultural and forest tree species received by the Division for various purposes.

As was the case last year, the number of samples received increased significantly; the average at present is 1 500 a month.

Most of the samples received were of the following kinds: grasses, maize, sorghum, lupins, beans, peas, cabbage, tomatoes and carrots.

A total of 36 752 tests of all kinds were carried out. Most of these were tests for germination (16 660), purity (9 729) and defective seed (4 200).

FIELD INSPECTION SERVICE

Seed certification

This function includes the administration and application of the following schemes which have as their object the production of seed of a high quality:

1. *The Basic Seed Scheme*, in terms of which basic seed is grown for the production of certified seed under the Seed Certification Scheme and the OECD Scheme.
2. *The Seed Certification Scheme*, in terms of which variety-true and variety-pure seed of known origin is grown.
3. *The Export Seed Scheme*, in terms of which only basic seed supplied by overseas seed firms is multiplied under official supervision in the Republic.
4. *The OECD Herbage and Oilseeds Scheme*, which is similar to the Seed Certification Scheme, but enjoys international recognition.

The second table on the next page shows the mass (kg) of seed certified under the various schemes.

There was a striking increase in production in terms of the OECD Herbage and Oilseeds Scheme, especially in the case of lupin seed.

The following are the kinds of which the largest quantity of seed was certified: maize, lupins, cotton, peas, beans, carrots, beetroot, cucurbits, onions, cabbage and blue buffalo grass.

The production of certified vegetable seed, particularly of the crops peas, beans and onions, increased in comparison with the previous year, but grass seed production dropped.

About equal quantities of white and yellow hybrid maize seed were certified. The quantity of certified hybrid maize seed grown (29 590 255 kg) was lower than last year. The following are the most important of the maize hybrids of which seed was certified:

White: PP X K64r, NPP X K64r, SSM 35, SA5, PPP X K64r.

Yellow: SSM 42, SA 4, SSM 40.

Abundant rains hampered the production of seed in various ways.

Number of inspections carried out

The third table appearing on the next page indicates the number of inspections carried out and the total area inspected per crop group.

In all 43 dealers and co-operatives and 862 nurserymen participated in the schemes. Seed of 25 kinds and 180 varieties was certified.

Seed group	Certification scheme	Public	Purposes			Research	Total
			Trade checks	Export seed	Import seed		
Field crops	4 096	3 508	1 714	492	969	229	11 008
Horticulture	963	3 721	1 256	3	1 253	117	7 313
Forestry	-	-	-	-	-	262	262
Total 1975/76	5 059	7 229	2 970	495	2 222	608	18 583
Total 1974/75	5 366	5 778	2 235	526	1 593	367	15 865

Crop group	Basic Seed Scheme	SA Seed Certification Scheme	Export Seed Scheme	OECD Herbage and Oilseeds Scheme	Total
Vegetables	29 468	1 696 976	69 851	-	1 796 295
Field crops	434 807	29 963 865	1 475	863 867	31 264 014
Pastures	3 026	33 916	-	1 200	38 142
Total 1975/76	467 301	31 694 757	71 326	865 067	33 098 451
Total 1974/75	599 602	37 311 591	33 380	492 125	38 436 698
Total 1973/74	260 070	23 229 677	85 846	63 207	23 638 800

Crop group	Number of inspections	Total area inspected and approved (ha)
Vegetables	1 789	3 273
Field crops (excluding maize)	221	4 042
Hybrid maize: white and yellow	4 897	21 807
Pasture crops	33	615
Total: 1975/76	6 940	29 737
Total: 1974/75	5 946	27 561

(b) Tuber inspection

The quantity certified was 619 546 x 30 kg, as against 626 624 x 30 kg the previous year. About 63 000 x 30 kg was rejected, chiefly for exceeding the nematode tolerances, potato tuber moth infestation, rotting of tubers, *Rhizoctonia* infection and late blight.

A certification regions

(a) Field screening

A class foundation seed potatoes are grown chiefly in the Transvaal, the Eastern and Central Free State, Natal and the Western Cape. Of the 3 118 ha submitted for certification, only 100 ha was rejected, chiefly on account of virus diseases, poor development and insufficient isolation.

(b) Tuber inspection

A total of 626 711 x 30 kg was certified, as against 509 865 x 30 kg the previous year. This represents an increase of 116 846 x 30 kg. A total of 11 064 x 30 kg was rejected for exceeding the nematode tolerances, potato tuber moth infestation and rotted tubers.

SEED POTATO CERTIFICATION

Foundation seed potatoes (Potato Board's multiplication unit)

(a) Field screening

The following areas (ha) of the various varieties were inspected and approved:

Up-to-Date	: 4,35
BPI	: 6,3
King George	: 1,6
Van der Plank	: 1,5

No virus infection occurred. A hail storm did serious damage to the BPI planting.

(b) Tuber inspection

The following quantities (30 kg units) of the various varieties were submitted and certified:

Up-to-Date	: 3 316
BPI	: 3 136
Van der Plank	: 1 061
King George	: 864
Total	: 8 377

AA certification regions

(a) Field screening

In the AA region, which is situated chiefly in the Northern Cape, the Western and Southern Free State and, to a lesser degree, in the Transvaal, the Central and Eastern Free State, Natal and the Western Cape, 4 371 ha was submitted for inspection. This is about 600 ha less than the previous year. Some 315 ha was rejected, chiefly on account of high virus infection.

General

(a) Varieties

The following table shows the relative importance of the chief varieties of which seed potatoes were certified:

Variety	Quantity (x 30 kg units) of seed potatoes certified (including all classes)
Up-to-Date	490 330
BPI	488 246
Van der Plank	184 358
Koos Smit	29 302
King George	24 573

(b) Performance tests

Altogether 1 472 samples were planted for purposes of performance testing. The tests give an indication of the efficiency of virus disease control by seed potato producers, whose continued membership of the scheme depends on the outcome

of these tests. The number of unsatisfactory results dropped as a result of determined attempts by the industry to control virus diseases.

PLANT IMPROVEMENT SCHEMES

The plant improvement schemes in operation at present have no legal status and are administered solely on the basis of voluntary participation. It will be possible to establish schemes governed by regulations in terms of the new Plant Improvement Act of 1976.

VINES

Parent blocks

(a) Rootstocks

Some 518 000 rootstocks, consisting chiefly of 101-14 and Richter 99, have been established in 97 approved blocks; 2 946 000 scions and 2 772 000 cuttings for planting qualified for certification during the winter of 1976.

(b) Scions

In view of the dubious virus status of the material being multiplied at present, certification has been discontinued. Heat-treated foundation material will become available for multiplication within the foreseeable future.

DRUPES

(a) Peaches, apricots, plums

(i) Scions

The following number of varieties were established at SAPO's foundation nursery at Ceres:

Peaches	-	2 (100 trees)
Apricots	-	4 (700 trees)
Plums	-	6 (700 trees)

In future this will be the only source of material under the Certification Scheme.

(ii) Rootstocks

The following number of rootstocks have already been established by SAPO for rooting

M793	47 000
B12	15 000
Kweper A	7 000
Marianna	6 800

(iii) General

In terms of the scheme governing visually approved propagating material, the following number of grafted trees qualified for certification during the winter of 1976:

Kinds	Number of varieties	Number of trees
Peaches	9	211 000
Apricots	2	12 000
Plums	1	14 000
Prunes	2	19 000
Total		256 000

POMES

In all 1 815 parent trees have qualified as propagation sources for the production of certified material under the visual selection scheme. The following number of trees qualified for certification during the 1976 season:

Apples (4 varieties)	-	15 000
Pears (4 varieties)	-	51 900

STRAWBERRIES

The scheme is progressing very favourably and making a positive contribution to the improvement of yield and quality. Eight nurserymen are participating and the following numbers of plants of the various varieties have been certified:

Parfaite	1 840 800
Selekta	746 000
Earlibelle	120 000
Tioga	108 000

ROSES

Owing to the abundant rains the application of the scheme had to be postponed.

PRODUCTION OF FLOWER BULBS FOR EXPORT

The area and number of bulbs increased significantly since the previous year.

(a) Winter bulbs

Seventeen bulb varieties, covering an area of 72 ha and producing 80,7 million bulbs, were submitted for inspection. The only rejection was one hectare under freesias, which was rejected on account of virus infection.

(b) Summer bulbs

A total area of 19,5 ha, on which 9 bulb varieties (yield 2,9 million bulbs) were grown, was submitted for inspection and approved.

(c) Chrysanthemums

Inspections were carried out at 2 nurseries with a view to exporting cuttings. About 6 ha, mostly under glasshouses, was involved. Twenty-one million cuttings were approved.

PEST CONTROL

NURSERIES

(a) Registration

Altogether 1 748 nurseries, 416 of which were vine nurseries, were registered with the Department.

(b) Diseases and pests

Forty-six nurseries - 31 in the Transvaal and 11 in the Cape Province - were placed under quarantine.

Quarantine was imposed chiefly on account of the following diseases and pests:

Nematodes, woolly apple aphids, red scale, Ross scale, pernicious scale, white peach scale, crown gall and *Phytophthora cinnamomi*.

(c) Stocks and nurseries

The following table shows the number of trees or plants, and the main types or cultivars, available in registered nurseries.

Group or type	Total 1975/76	Main types or cultivars	Total per type or cultivar
Peaches	2,2 million	Kakamas	341,7 thousand
		Oom Sarel	410,8 thousand
		Prof. Neethling	475,5 thousand
		Prof. Malherbe	183,6 thousand
Plums	234,9 thousand	Sungold	47,3 thousand
		Santa Rosa	54,8 thousand
		Harry Pickstone	25,1 thousand
Apples	749,7 thousand	Granny Smith	320,3 thousand
		Starking	162,1 thousand
		Golden	90,7 thousand
		Delicious	
Apricots	573,3 thousand	Bulida	269,3 thousand
		Royal	174,5 thousand
Citrus	642,1 thousand	Navels	209,9 thousand
		Grapefruit	120,5 thousand
		Lemons	109,8 thousand
Subtropical fruit		Avocados	178,1 thousand
		Mangoes	161,3 thousand
		Loquats	425,1 thousand
		Litchis	182,9 thousand
		Olives	34,4 thousand
Nuts	922,3 thousand	Macadamia	548,6 thousand
		Pecan	293,2 thousand
Ornamentals, trees and glasshouse plants	67,4 million	Shrubs (other)	33,4 million
		Forest trees	20,6 million
		Ornamentals	4,9 million
		Glasshouse plants	3,8 million
		Roses	2,1 million
		Hedge plants	2,4 million
		Palms	426,4 thousand
Vines			
Grafted vines	14,9 million		
Rooted ungrafted vines	2,5 million		

BACTERIAL BLIGHT SURVEY IN VINEYARDS

A total of 5,8 million parent vines were examined for bacterial blight. No new infection was found and quarantine was lifted on 11 plots.

INSPECTION OF FRUIT FOR SCALE

In all 1 528 130 units, 7 815 of which were rejected, were inspected for the presence of pernicious scale. These inspections are carried out on fruit intended for export.

COMPULSORY PURIFICATION OF ORCHARDS

With a view to the compulsory control of pernicious scale and grey scale, 840 spraying orders were issued to owners of infected premises in the ten proclaimed districts of the Western and South-Western Cape. The biggest difficulties are experienced with owners of domestic gardens, who do not realise the economic gravity of this problem. The average percentage control obtained is 80. Altogether 369 samples were taken for the determination of the presence of live insects and the identification of these scales.

CONTROL INSPECTIONS IN THE DECLARED AREAS FOR WART DISEASE

Owing to the shortage of staff it was impossible to give attention to this matter.

EMBARGO ON THE TRANSPORTATION OF BANANA PLANTS

In order to prevent the spread of burrowing nematode *Radopholus similis*, no person is permitted to transport or allow to be transported any banana propagating material in the Transvaal or Natal without a permit. Thirty-eight permits were issued after 56 samples had been analysed and no infestation had been found.

INTERNATIONAL PLANT AND SEED SERVICES

RELATIONS WITH INTERNATIONAL BODIES

Seed certification schemes of the Organisation for Economic Co-operation and Development (OECD)

South Africa continued its membership of the OECD certification schemes for herbage, oilseeds and vegetable seed.

The 1976 annual meeting of representatives of certification authorities under the OECD seed schemes took place in Paris from 26 to 29 April 1976. South Africa was represented at the meeting by Mr L.J. Grobler, Assistant Director of the Division of Plant and Seed Control.

The following were among the most important matters discussed at the meeting:

- Proposals for amending the schemes with regard to variety purity and trueness to type, certificates, duplicate labels within containers and the sealing and labelling of containers were accepted.
- The final text of the Maize Seed Scheme was approved for submission to the Committee for Agriculture with a view to approval by the Board.
- A number of *Medicago* species were added to the list of kinds to which the subterranean clover seed scheme applies.

During this period 136 753 kg of seed, consisting chiefly of lupins was certified, in terms of the OECD Herbage and Oilseeds Scheme. This volume is expected to increase in future. The seed is intended for export.

International Seed Testing Association (ISTA)

South Africa continued its membership of ISTA.

The following officers from the Division of Plant and Seed Control serve on the following committees of ISTA:

- (a) Executive Committee: Mr J.F. van Wyk
- (b) Seed Moisture and Storage: Mr J.F. van Wyk (Chairman)
- (c) Seed Packing and Sampling: Mr L.J. Grobler
- (d) Germination: Mrs B. Wium
- (e) Flower Seed: Mr J.F. van Wyk

Owing to the resignation of Mr J. Hewitt, South Africa was obliged to withdraw from the Committee for Purity and the Committee for Statistics.

Mr J.F. van Wyk, Director of the Division of Plant and Seed Control, attended the Association's inter-convention meeting in Stockholm in the capacity of member of the Executive Committee. Progress reports from technical committees, administrative matters concerning the Association and preparations for the 18th congress, which will take place in Madrid from 6 to 14 May 1977, were among the matters discussed.

The Republic has been authorised by the Executive Committee to issue internationally recognised seed analysis certificates.

European Economic Community (EEC)

Close liaison is maintained with the EEC, especially with regard to guidelines for seed, through the SA Agricultural Counsellor (Economic) in Brussels.

According to resolutions of the EEC the date after which no uncertified (commercial) lupin seed may be imported into EEC countries, with the exception of West Germany, has been fixed at 30 June 1980. In the case of West Germany the date is 30 June 1977. Relatively large quantities of lupin seed are exported from South Africa to EEC countries.

The EEC extended equivalence for the inspection and certification of certain kinds of seed in South Africa to 30 June 1980.

Union for the Protection of New Plant Varieties (UPOV)

South Africa was represented at the latest board meeting of UPOV by officers from the Office of the Agricultural Counsellor in Paris, who attended as observers, and at the meetings of the various working parties of this body.

The Government has approved South Africa's proposed application for membership in UPOV in principle. Membership of UPOV and signature of the convention would result in a reciprocal

agreement on plant breeders' rights between South Africa and other members of the body which would entail many advantages for agriculture in the Republic.

International Plant Protection Convention (IPPC)

South Africa remained a member of the IPPC. In terms of its membership the Republic is entitled to issue the internationally recognised Rome model phytosanitary certificate in respect of plants and plant products.

International Seed Merchants' Federation (FIS)

Although this is a private international organisation, of which the Seed Merchants' Association of the RSA is also a member, the Division maintains a direct link with the Federation in order to keep abreast of new ideas, problems and policy in the international seed trade.

IMPORTS AND EXPORTS OF PLANTS, PLANT PRODUCTS AND APIARY PRODUCTS

Under the Seeds Act and the Agricultural Pests Act the Division can exercise control over the quality and/or phytosanitary condition of plants, plant products (including seed), bees and apiary products that are imported or exported. Specific standards are laid down with regard to the quality of imported seed.

As a member of the International Plant Protection Convention, South Africa is involved in a world-wide campaign to control the movement of harmful diseases and pests of plants and plant products across national boundaries.

Certain requirements with regard to the phytosanitary condition of any such material imported into the Republic are laid down under the Agricultural Pests Act, and importation is subject to a plant import permit in which the requirements are specified. As evidence that the imported material meets the requirements, a phytosanitary certificate, issued by the authorities of the exporting country, must accompany each consignment. Similarly the Division issues phytosanitary certificates in respect of material exported where specific phytosanitary requirements are laid down by the importing country.

Imports

Seed

The table at the top of the next page shows the various groups of seed and the quantities (kg) imported for various purposes.

The total quantity of seed imported increased by about 600 000 kg in comparison with the figure for the previous year.

The largest quantities of seed imported were of the following types:

Group	Purpose for which imported						Total
	Commercial sales: listed varieties	Experimental	Multiplication for export	Commercial sales: unlisted varieties to relieve shortages	Re-exporting	Canning/processing	
Vegetable crops	1 243 928	342	21 215	-	100	362 919	1 628 504
Field crops	2 692 316	11 751	-	80 000	-	-	2 784 067
Forage legumes	144 674	6	3 340	670 000	-	-	818 020
Forage grasses	594 122	35	-	-	-	-	594 157
Total	4 675 040	12 134	24 555	750 000	100	362 919	5 824 748
						1974/75	5 190 170

Vegetable crops: Cabbage, turnips, Swiss chard, garden beet, watermelon, carrots, tomatoes, garden beans, garden peas, sweetcorn.

Field crops: Forage turnips, cotton, lucerne, sorghum, maize.

Forage legumes: Medics, clovers.

Forage grasses: Rough cocksfoot, tall fescue, rye grass, sorghum.

The various crop groups represented the following percentages of the mass of seed imported, in comparison with the previous three years.

Crop group	1975/76	1974/75	1973/74	1972/73
	%	%	%	%
Vegetable crops	27,86	47,80	42,99	48,18
Field crops	47,80	36,96	39,22	29,66
Forage legumes	14,09	3,13	1,43	1,52
Forage grasses	10,25	12,11	6,36	30,64

Vegetable seed imports dropped by about 20 per cent but imports of field crop seed rose by about 11 per cent as against the previous year.

Plants, plant products, bees and apiary products

The following table shows the mass or quantity of the various types of imported material inspected for diseases and pests, together with the number of plant import permits relating to the mass or quantity concerned:

Nature of imported material	Mass or quantity inspected	Number of plant import permits
Plants	3 220 878	585
Bulbs, tubers and rhizomes	30 492 379	126
Seed potatoes	454 871 kg	18
Seed (declared under the Agricultural Pests Act)	6 257 756 kg	779
Tobacco	3 998 916 kg	37
Fruit	627 854 kg	11
Cotton and cotton samples	23 067 597 kg	137
Broom reeds	5 570 kg	7
Beeswax	14 515 kg	13
Nuts	402 391 kg	-
Timber	225 948 m ³	-
Herbs, spices, ginger, etc.	6 412 276 kg	13
Cut flowers (fresh and dried)	28 912 kg	1
Fibre, cane, peat moss	14 710 406 kg	22
Seed (undeclared)	4 873 491 kg	

Notably larger quantities of tobacco, fruit, cotton lint, herbs and spices were imported than last year. Fewer seed potatoes, nuts and fibre products (cane, coir) were imported, however.

The number of phytosanitary inspections carried out on plants, plant products and apiary products was 9 749 (2 200 fewer than during the previous year).

Imports of containerised products are increasing - which will mean that new demands will be made on the Division in future and certain adjustments will be necessary to enable the system to function as efficiently as possible while retaining effective phytosanitary control.

In cases where the requirements were not met - 814 in all - the material was either destroyed (in serious cases) or the importer was permitted to return the material to the country of origin or to apply effective disinfection measures or to plant the material for observation under strict quarantine.

Exports

Seed

Compulsory quality control is applied to export lupin seed only, chiefly in order to comply with the EEC requirements.

International seed analysis certificates are issued for seed on a voluntary basis. In all 495 certificates of this types covering 4 539 758 kg of seed (mainly lupins, serradella, sunflowers, babala and weeping love-grass) were issued.

Plants and plant products

The table which appears at the top of the next page shows the mass or quantity of the various types of export material inspected for diseases and pests, together with the number of phytosanitary certificates issued after such inspections:

There was a drop in the quantity of seed, plants, cuttings, bulbs, tubers, rhizomes, seed potatoes, maize and groundnuts submitted for phytosanitary certification in comparison with figures for the previous year. On the other hand larger quantities of cut flowers, table potatoes, vegetables and fruit were certified for phytosanitary purposes. There was a further increase in aerial exports, particularly of flowers, fruit and vegetables.

A total of 12 974 phytosanitary certificates (1 624 more than during the previous year) were issued.

Nature of material exported	Mass or quantity inspected (kg, unless otherwise indicated)	Number of phytosanitary certificates issued	Nature of material exported	Mass or quantity inspected (kg, unless otherwise indicated)	Number of phytosanitary certificates issued
Seed (general)	145 048 466	1 103	Potatoes (seed)	2 874 190	54
Plants and cuttings (units)	23 786 855	768	Potatoes (table)	11 353 533	276
Bulbs, tubers and rhizomes (units)	45 522 571	340	Maize	2 679 830 750	1 118
Cut flowers (fresh and dried)	1 060 984	2 810	Vegetables, etc.	11 519 572	2 194
Other	31 739 608	189	Fruit	657 956 873	3 135
Groundnuts	43 883 516	974	Timber	1 480 m ³	13

NATIONAL COLLECTION OF INSECTS

GENERAL COLLECTION

Mr G.L. Prinsloo, assisted by two responsible officers and three assistants, has served as curator of the General Collection of the National Collection of Insects (NCI) since 1976.

Preparations for transferring the General Collection to Vredehuis, Vermeulen Street, Pretoria, were started in February. It was decided to move the collection in view of the limited space available and the fire hazard at the premises in the Agriculture Building. The collection has been housed in the old herbarium premises at Vredehuis since March 1976. These premises are sufficiently spacious to permit considerable expansion of the collection and have fireproof shutters.

Since the type collection forms the most important part of any collection of insects and determines its value, priority was given to care of the type specimens. The 1 500 primary type specimens were transferred to separate unit cases for maximum protection against damage.

A new identification service was started with the aim of providing a more efficient service to researchers and the public. Briefly, this service is based on a system whereby people are kept informed of the progress made with identifications.

The rearrangement of the entire collection, which consists of over 2 500 drawers containing insects, was started. This project will take at least eighteen months.

The intensive collection of seed-eating beetles associated with *Acacia* trees was undertaken by an officer as part of a taxonomic study.

A start was made on the assembly of a reference library consisting of books from the central library. These books will be transferred to the library at Vredehuis.

SCALE INSECTS

Armoured scales

Routine identifications of 34 samples of scale insects were made for members of the public and institutions in the Republic of South Africa (26), Israel (6), Rhodesia (1) and New Zealand (1).

One field survey trip to the Grahamstown and Uitenhage districts, undertaken during August 1975, yielded about 40 new accessions, which are now being studied.

The revisionary study of armoured scale insects of the tribe *Odonaspidini* is being continued. Besides the preparation of redescrptions of old species, this study has so far resulted in the discovery of several new species in South Africa, South West Africa and overseas countries.

In conjunction with Dr M.L. Williams and Mr C.H. Ray Jr., both of Auburn University, Alabama, USA, a study was undertaken and finalised; the object was to establish the hitherto inadequately known taxonomy of the mango shield scale, *Protopulvinaria mangiferae* (Green). This scale insect is a serious pest of mango in several countries, and it is known to occur in Africa as well.

Together with Mr A.J. Prins, South African Museum, Cape Town, and Mr D.J. Rust, Fruit and Fruit Technology Research Institute, Stellenbosch, a study was initiated and finalised on the association of ants with armoured scale insects: that of the ant *Melissotarsus* sp. with the diaspidid *Morganella conspicua* on the proteaceous tree *Leucospermum praemorsum* in the vicinity of Clanwilliam, CP. This is the second record in the world of this little-known type of association.

Research into the biology and taxonomy of the *Margarodes* species in southern Africa has been started. Some species of this genus are serious pests of vines in the southern Cape Province.

Mealybugs and soft scales

Routine identifications and advice have been supplied to institutions and researchers in the Republic of South Africa, England, France, Greece, Hungary, Italy and Rhodesia.

Work on the status and identity of the vine mealybug *Planococcus ficus* (Signoret) has been completed and the conclusions published. It is worth noting that economic entomologists in France and Italy have endorsed the hypothesis set forth in the paper that this species, often confused in the past with the citrus mealybug, actually does not thrive on citrus.

Research on the status and identity of thirteen old species of mealybugs, with descriptions and illustrations of four new species, has been finalised and the manuscript submitted for publication. This work includes a critical revision of the genus *Allococcus* Ezzat & McConnel, 1956, to which five old and new species from South Africa have been assigned, with a key to their separation.

Work on wax scales is being modified so as to include keys to the genera and species occurring in

South Africa, with diagnoses and drawings of a couple of old and/or new species.

A detailed analysis has been made of meteorological data from regions characterised by winter rainfall; this is needed to support the hypotheses relating to world distribution of the black scale, *Saissetia oleae* (Olivier) as a plant pest.

From data on black scales collected since 1954 it has been possible to put together a preliminary picture of the situation in southern Europe. This paper, which was published during 1976, will serve as a foundation for further research on the complex of species occurring in that region.

TERMITES

An aggregate of 486 routine determinations of Isoptera was made during the year under review. Of these 41 were of samples (not retained) submitted for naming by the public or institutions at home or abroad, and 445 were of series from southern Africa comprising the main segment of the annual termite increment to the National Collection of Insects (NCI).

The last of the four scheduled Rhodesian termite surveys was finalised during October/November 1975 by a Rhodesian contingent consisting of personnel supplied by the Atlantica Ecological Research Station and the Plant Protection Research Institute, Salisbury. The final expedition yielded 1 108 samples in 30 genera of Isoptera.

Two field survey trips were undertaken during the past year: during September/October 1975 sampling was done at 41 localities in the North-Western Cape Province and southern South West Africa, yielding 257 series in 13 genera of Isoptera; on the second trip, undertaken during April 1976, termites and termitophiles were collected intensively at 13 localities in the hitherto uncollected Wolkberg area of the Pietersburg district of the Transvaal, yielding 178 series in 13 genera of Isoptera, plus 13 series (177 specimens) of assorted termitophiles. An intensive search for termitophiles of *Hodotermes mossambicus* (Hagen), involving nest excavations on the farm Olifantsfontein, Pretoria district, was completed during November/December 1975: the yield was 155 specimens in four species of termitophiles Coleoptera.

With the inclusion of three donated series from Ethiopia, Kenya and Zaire the annual increment to the National Collection of Insects (NCI) totals 448 series in 26 genera of Isoptera: at 30 June 1976 there were 32 521 termite samples in the NCI.

Work has been continued on compiling for publication the series of papers in which are treated the biology, ecology and geographical distribution of Isoptera occurring in southern Africa: Parts 10 and 11, in which respectively the genera *Hodotermes* Hagen and *Coptotermes* Wasmann are dealt with, were published during the year under review, and Part 12, in which the genus *Porotermes* Hagen is treated, has been finalised and sent to

press. Work has started on Part 13, which deals with the genus *Pseudacanthotermes* Sjöstedt.

The revision of the African genus *Allodotermes* Silvestri, which has proved to be far more complicated than was anticipated when the study was initiated in 1972, has been continued. It has involved detailed examination of 1 176 colony samples, of which 1 091 are deposited in the NCI; with such a wealth of material, intra-specific variability is being documented as never before in the Isoptera and, in spite of the numerous quantitative characters and ratios that have been tried, quite a few series still remain of doubtful identity. In spite of difficulties it has been established that there are four species of *Allodotermes*, of which three occur in southern Africa. Their detailed description is in the process of being compiled for publication.

An aggregate of 434 specimens in 18 series of termitophiles was obtained from ten nests of various host species: *Hodotermes mossambicus* Hagen (157 specimens in 5 series from 2 nests); *Cubitermes* sp. (22 specimens in 2 series from 2 nests); *Macrotermes natalensis* (Haviland) (242 specimens in 8 series from 4 nests); *Trinervitermes trinervoides* (Sjöstedt) (13 specimens in 3 series from 3 nests). All collections were made in the Transvaal. With the exception of two Diptera (Phoridae), the entire termitophile increment is comprised of Coleoptera (Pselaphidae: 1, Staphylinidae: 431).

Two new species of termitophilous Pselaphidae taken during the course of Rhodesian termite surveys have been described by Leleup (1975): *Leleupiaaster jeanneli* and *Tropeogaster pretoriusi* which respectively were associated with *Ancistrotermes latinotus* (Holmgren) and *Schedorhinotermes lamanianus* (Sjöstedt). Kistner (1976) has described a new species of Staphylinidae *Physoperinthus setosus*, which was taken in Rhodesia in association with *Fulleritermes coatonii* Sands - the first record of termitophiles from this host species. Also recorded from Rhodesia is *Fulleroxenus coatonii* Kistner, a guest of *Fulleritermes contractus*, which has previously been recorded only from South West Africa.

During the year under review named specimens of two species of termitophilous Carabidae and five of Pselaphidae were returned to the NCI by Drs P. Basilewsky and N. Leleup, respectively, of the Musée Royal de l'Afrique Centrale, Tervuren: three of the pselaphid species are represented by holotypes and another by an allotype male.

FRUIT FLIES

Practically undivided attention has been given to the monographic revision of the African Dacinae. Descriptions of species, generic diagnoses and preliminary taxonomic arrangement of the group *Dacus* s.l. are ready to be written up finally. Later work has been on the *Psilodacus* s.l. group of remarkable and highly specialised species. Further dissections and sketches have been needed; strong

differences in genitalia indicate species groups that cannot easily be identified on external characters, and in various species there are not enough specimens to make dissection possible. The preliminary write-up of the morphological section of the work is continually checked against subsequent observations on species.

GRASSHOPPERS

Two field survey expeditions were made to selected parts of Natal; this maintained the steady inflow of material into the National Collection. A total of 800 accessions of grasshoppers and miscellaneous insects resulted. Taxonomic research was aimed at completing the task of determining and incorporating all the unsorted holdings into the National Collection.

In this regard some 80 genera comprising 114 species belonging to the subfamily Truxalinae and the families Pyrgomorphidae and Lentulidae received attention and were incorporated into the main collections. New records for the Southern African Region are *Quangula minuta*, *Cophohippus burri* and *Goniocara brevipes*, which were recorded for the first time from South West Africa and the Caprivi in the course of locust work there. This concludes the first phase of the expansion of the National Collection of Acridomorpha.

CARPENTER BEES

Xylocopa lugubris, previously thought to be a univoltine species, was found to have more than one generation per year in the Wolkberg mountains of the Northern Transvaal. Samples collected in the Wolkberg in May, August and October showed that the nests contained an average of three to six larval cells each. This suggests that *X. lugubris* lays eggs throughout the winter, spring and early summer in the Wolkberg, ample time for two generations to be completed each year. A sample collected in March 1976 indicated that the entire Wolkberg population of *X. lugubris* consisted of adults which had probably been reproductively inactive throughout the wet summer, when about 1 400 mm or more rain falls in the Wolkberg.

During the year collections of solitary bees were made wherever possible.

THRIPS

Specialised taxonomic research of the Thysanoptera has been resumed in the National Collection of Insects since January 1976. The existing collection of thrips, one of the most important of its kind in the world, has been curated since the retirement of the late Dr J.C. Faure by the General Collection of the NCI. It has now been extracted and is housed separately.

An initial field survey expedition to the Wolkberg area of the Northern Transvaal was completed during March 1976: the increment, which is under study at present, has yielded at least two new species of thrips.

PARASITIC HYMENOPTERA

During a visit to the British Museum Mr G.L. Prinsloo concentrated chiefly on the family Encyrtidae, a group of important insect parasites. A large number of specimens were collected and identified and are at present housed in the National Collection.

The collections of Encyrtidae and Aphelinidae, the two most important families on which work is in progress, are being expanded all the time. Accessions of these families now total 5 026. The building up of collections of the other groups of Chalcidoidea has been started with a view to intensive work on other families at a later stage. There are no sizable collections of these insects elsewhere in Africa. Several thousand specimens, representative of twelve families, have been collected in the Transvaal and the Cape.

Several parasitic wasps associated with pest insects of importance in biological control programmes have been identified. The identifications were undertaken for researchers in the Republic, Rhodesia, the Republic of the Congo, Sao Tomé and Turkey.

Taxonomic studies dealing with South African species of the genus *Euxanthellus* Silvestri (Aphelinidae) have been completed and published. The species of this genus are of importance in the control of soft scales, particularly on citrus. A publication on various new species of Encyrtidae from South West Africa has also been completed. Our knowledge of the fauna of this part of Southern Africa is extremely limited and further study on this subject is planned.

A study of *Paraphaenodiscus* Girault, a genus which is also known in Australia and Europe and parasitises soft scale, has been completed. The work included the description of three new species from South Africa. Three publications on the genus *Microterys* Thomson in Australia and Africa, which were completed in 1974/75, also appeared.

NEMATODES AND EARTHWORMS

The national collection of nematodes was expanded to 11 580 slides, representing about 52 800 specimens. A few thousand nematodes were collected - they represent 25 species from 5 families. Further taxonomic studies of the plant-parasitic genera *Rotylenchus* and *Scutellonema* were undertaken. In the course of a study on the plant-parasitic genus *Pratylenchus* five previously described species were described from South Africa for the first time.

During the year under review about 1 550 routine soil and root samples were dealt with. They came from farmers and private and Departmental bodies. A further 764 bulb and root samples, received from the Division of Plant and Seed Control, were examined for the presence of harmful nematodes.

MITES AND SPIDERS

Accessions of mites amounted to 630 during

the year under review, with a total of 989 identifications - 350 for Nigeria, 25 for Rhodesia and 10 for India. The identifications represent 63 species, including 40 species of plant mites and other harmful species belonging to 6 families, and 53 predatory species belonging to 16 families.

During the year under review 135 specimens were collected from agricultural crops and wild plants.

Accessions of spiders amounted to 897. The identifications were made chiefly for local researchers.

INSECT CONTROL AND RESEARCH

Some 40 new remedies and 300 amendments to existing registrations of insecticides, fungicides and rodenticides have been reviewed and recommended for registration under Act 36 of 1947.

The annual Departmental communication "A Guide to the Use of Pesticides and Fungicides in South Africa" (237 pages) was updated and appeared in August 1975.

VIRUS DISEASES OF INSECTS

The laboratory efficacy of the *Heliothis armigera* viruses was established and a small-scale exploratory field trial was conducted. The results were encouraging and it has been decided that larger trials will be conducted at Buffelspoort, Transvaal, and Stellenbosch during the ensuing year.

PESTICIDE RESIDUES

A series of trials was carried out to determine how long pesticide residues persist on a number of agricultural crops. It was found that aerial spraying of grain sorghum did not give the even cover expected. The residue on the leaves decreased rapidly, and seven days later there was hardly any pesticide present.

When cotton was sprayed to control cotton bollworm it became clear that certain climatic factors had an important effect on the residues of the preparations used.

The study of the survey on soil-systemic pesticides in cole crops was continued. It is clear that a preparation such as phorate is degraded in the plant to poisonous products which remain present in the cabbage head for longer than the prescribed safety period. These poisonous degradation products still provide control of the cabbage aphid.

Determinations of the residue of chlorinated insecticides in dairy products were undertaken in co-operation with the Animal and Dairy Science Research Institute. Certain insecticides, including DDT and dieldrin, were found to occur in butter and fresh milk, although chiefly at a very low concentration.

The incidence of pesticides in food prepared for human consumption was investigated by means

of random sampling. Preliminary results indicate that low concentrations of organophosphates occur in fruit and vegetables, and there are also low concentrations in grain products. Chlorinated insecticides are found fairly generally in meat and meat products.

Trial spraying was carried out on a fenced off dam in the Renoster River to determine how much of the pesticide is present in the water. Fention was used for the spraying. It was found that residues were very high directly after spraying, but if the flow of the river exceeded 20 cumecs, this concentration was reduced and diluted within a week. With a smaller flow or a stagnant dam the concentration remained high for at least 21 days, so that spraying is not recommended.

RESISTANCE TO INSECTICIDES

It became clear during the 1974/75 season that red scale in the Letaba Valley of the Eastern Transvaal was not being killed to the desired extent by "normal" spraying with organophosphates such as parathion. As far as is known this is the first case of resistance of this type in the world.

Because there are no practical chemical alternatives to organophosphates for controlling scale, the problem was studied more closely in the laboratory. The susceptibility of scale in the Nelspruit area was compared with that of scale from the Letaba area. It was found that it required over six times as much parathion to kill the Letaba red scale as effectively as the Nelspruit scale. It was also established that the immature forms of the scale are far easier to kill than the adult forms. For instance, the LD₅₀ (dose required to kill 50% of the population) of parathion for adult females from Letaba was 1 630 ppm, whereas the dose for first stage individuals was 382 ppm. This finding can be applied in the field in the chemical control of red scale by administering the insecticide when the population on the crop is mainly in the immature stage.

INTEGRATED CONTROL OF COTTON PESTS

A number of new preparations against American bollworm *Heliothis armigera* were tested at Rust de Winter. Two preparations made a good showing, against red spider mite as well as bollworm, but a third which controlled bollworm well appeared less promising because there was a build-up of red spider mite.

Although an imported egg parasite of *Heliothis* was released, no parasites have been recovered this season. The average egg parasitism by the indigenous *Heliothis* parasites was 26 per cent, with *Telonomus* as the dominant parasite. *Spodoptera littoralis* larvae were found regularly in pit traps, but no damage to cotton was observed. The cotton semi-looper *Anomis flava* built up on an unsprayed plot, but did no damage that was economically significant.

Insecticides were tested at Vaalharts against American bollworm and red bollworm, but owing



Damage to prickly pear caused by the cactus borer weevil *Metamasius spinolae*. The photograph was taken near Uitenhage

to the abnormally wet conditions and low insect numbers no clear-cut conclusions could be drawn.

PHYLLOXERA

It was found that it was possible to suppress a phylloxera infestation for two seasons if the soil was covered with water for six successive weeks in winter.

In the Stellenbosch area it was found that hexachlorobutadiene at a dose of 250 kg per ha for four successive seasons gave 100 per cent control of phylloxera.

Margarodes prieskaensis and *M. capensis* are already known to occur on vines. Another species, *M. greeni*, has now been found on vines in the Worcester area and on apple trees in the Piketberg area. In the case of vines growth vigour and bearing are reduced by this species, and apple trees are killed completely. *M. greeni* has also been found on kikuyu in the Groot-Drakenstein, causing lawns to die in patches.

Laboratory observations with *M. capensis* were continued, and it would appear that 25 °C is the optimum temperature for egg production. The incubation period was 35 to 49 days.

KAROO CATERPILLAR

During the past season there have been isolated serious outbreaks of Karoo caterpillar in the western parts of the Karoo, especially in the Fraserburg district. A preliminary investigation into the incidence of Karoo caterpillar moth indicates a high correlation between moth incidence and distribution of rainfall. It is possible that the relatively wet conditions of the past few seasons are partly responsible for the fact that fewer caterpillars occurred in the Eastern Karoo.

A census survey of the Karoo caterpillar at the Grootfontein College of Agriculture confirmed that the wasp parasite *Macrocentrus maraisi* is well

adapted to its host, and since it is the most important natural enemy of the Karoo caterpillar, it plays an important part in suppressing the caterpillar population.

Karoo larvae have been successfully bred on a fairly cheap and simple artificial nutrient medium. When suitable conditions for mating and oviposition can be created, there is a prospect of a valuable winter culture of the insect.

BROWN LOCUSTS

There were incipient outbreaks of brown locust *Locustana pardalina* (Walk.), in the western parts of the Karoo during the second half of the year under review, but there were no swarms in the central and eastern parts.

The swarms were typical of the incipient phase, viz small, poorly concentrated, with various stages of development in the same swarm; they flew badly and in no particular direction. Tracing and control were hampered by the wet conditions and the luxuriant stand of grass.

Control started on 10 February 1976 at Williston, and the last control unit was withdrawn from Loeriesfontein (Calvinia) on 24 May 1976.

The following eleven magisterial districts were involved: Calvinia, Carnarvon, Fraserburg, Gordonias (only the Kakamas area), Kenhardt, Namaqualand, Prieska, Sutherland, Vanrhynsdorp, Victoria West (only the Vosburg area) and Williston.

Large populations of brown locusts in these areas reached the adult stage without congregating in concentrations to which it was possible to apply control measures. The result was that oviposition was able to proceed unhindered. Population numbers in the rest of the brown locust area were very low.

Owing to residue problems BHC, which is at present still used as a dusting powder in locust

Highest number of control units	:	76
Number of swarms controlled: hopper	:	18 627
flier	:	3 659
Quantity of poison used	:	185 000 kg

campaigns, has had to be replaced. Several organophosphate insecticides were selected on the basis of laboratory results, and tested in the field against locust swarms. None of these insecticides provided any control when applied in powder form. A new technique for applying organophosphates had therefore to be developed.

Owing to the shortage and quality of water in the Karoo an ultra-low volume (ULV) spraying technique was chosen. Research showed that droplet sizes of 30 to 60 microns could be used to advantage in locust control. Equipment that discharges chiefly droplets of this size was developed in co-operation with the Division of Agricultural Engineering. This equipment, which is mounted on a light delivery vehicle, has already been tested against locust swarms and has proved most successful.

RED LOCUSTS

No swarms of this locust species were recorded from southern Africa during the year. Because of operating difficulties surveillance of the important Buzi outbreak area of Central Mozambique had, however, to be discontinued, with the result that the true locust position there, especially the 1975/76 scale of locust breeding, could not be established.

The red locust position in East Africa was, however, far from reassuring. Reliable reports received in Pretoria show that migrating swarms once again developed in the Wembere area of Central Tanzania during the dry season of 1975.

The major significant development to report in the Region served by SARCCUS was the formation of the new Red Locust Control Service (RLCS) which came into existence on 1 April 1976 with headquarters in Pretoria. This satisfies a long-felt need to have a properly centralised body responsible for monitoring and controlling red locusts in southern Africa and for restoring complete coverage for the Region against this notorious pest.

The RLCS will deal with swarms in the southern invasion area, which was previously the responsibility of individual governments and will accordingly operate, wherever possible, across the borders of the Republic to serve neighbouring African states as well. It will also promote technical co-operation in the field of locust control and will collect and disseminate information having a bearing on this problem to all interested African States in the SARCCUS region.

GRAIN SORGHUM APHID

Several behaviour studies of the two most important tortoise beetle predators of the grain

sorghum aphid were carried out during the year under review. Laboratory studies have confirmed that the finding of prey by the adult female beetle is a direct stimulus to oviposition.

Further consignments of live tortoise beetles *Adonia variegata* (Goeze) and *Lioadalia flavomaculata* (De Geer) were sent to Dr E. Salinas, Institute de Investigaciones Agropecuarias, La Cruz, Chile, with the assistance of the Department of Foreign Affairs. These tortoise beetles have been very successfully established in Chile where, according to Dr Salinas, they are doing good work in controlling aphids on wheat.

Further trials with the systemic insecticide carbufuran, in granular form, revealed that when granules were applied during planting they not only resulted in outstanding control of aphids on grain sorghum, but also provided effective control of the grain sorghum stalk borer.

GRAIN SORGHUM STALK BORER

Stalk borer infestations were again common on the Springbok Flats. A study of the moth population through the season revealed that moths that develop from overwintering larvae after the winter are very much smaller and lighter and have fewer eggs in their ovaries than moths that occur later in the season. The moths are biggest and most fertile during February, March and April. At this stage stalk borer infestations have little effect on the grain sorghum crop, however.

The grain sorghum cultivars SSK2 and NK262 showed fairly high stalk borer infestation, whereas SSK24, NK202 and C42A showed low levels of infestation. Further research on this matter is required.

INSECTS IN STORED PRODUCTS

A new cereal protectant has been tested on a small scale in the laboratory by means of a new technique which clearly illustrates its effectiveness against individual species. This technique has been successful from a practical point of view and particulars were submitted to the Maize Board so that large-scale trials in grain silos during the present season could be considered.

However, the technique has not been so successful from a scientific point of view, because the reaction of the insects has been very heterogeneous. This heterogeneity may be due to uneven precipitation of poison on the grain, poor sampling techniques, poor chemical analysis of residues, or intrinsic heterogeneity of the insects in the trials.

FOREST AND TIMBER INSECTS

Two aerial spraying experiments against *Pachypasa capensis* were carried out in the Jessievale Plantation.

Work on the black pine aphid *Cinara cronartii* T & P was continued. Several areas where trees, mainly *Pinus patula*, had died were visited. In no case could the death of these trees be ascribed

to the aphid. Factors such as shallow soil, drought and hail were the primary causes - the aphid may possibly have played a secondary role.

CONTROL OF OTHER ANIMAL PESTS

RED-BILLED FINCHES

Finch control during the year under review was confined to sporadic cases, most of which involved controlling roosting swarms.

Several trial sprayings were carried out at rivers to establish to what extent the water is polluted. The purpose was to obtain permission from the Departments of Water Affairs and Health to undertake finch control along public streams, where the flow exceeds a certain number of cumecs.

Eighty-six roosting and hatching swarms, spread over an area of 773 ha, were sprayed at a total cost of R139 600. It is estimated that about 26 131 000 finches were killed by means of spraying.

NEMATODES

Experiments were conducted to determine the accuracy of subsampling and sampling techniques for nematodes. All the experimental material was *Heterodera schachtii* or *H. rostochiensis*.

Larval populations of increasing sizes were built up in constant volumes of water and the accuracy of subsampling of these populations by means of McMaster slides was investigated. The distribution of nematode larvae in the liquid complied with the Poisson distribution. Although processing of the data is not yet complete, it is clear that subsampling of populations smaller than about 700 larvae per 25 ml of water is not sufficiently accurate for this process to be included in the normal experimental techniques. The ideal procedure is to count complete larval populations.

Cyst populations of increasing sizes in 1 500 g of soil were also prepared and the distribution of cysts in soil samples was investigated. Preliminary processing of the data indicates that the mixing process of the soil could have a major influence on the distribution pattern of the cysts.

In cotton

A survey was carried out at Jan Kempdorp to determine which plant-parasitic nematodes occur in plots where cotton is cultivated. The following genera were identified: *Trichodorus*, *Pratylenchus*, *Xiphinema*, *Tylenchorhynchus*, *Meloidogyne*, *Rotylenchus*, and spiral nematodes and Criconematidae.

A soil-systemic nematocide was tested on cotton near Jan Kempdorp. Promising results were obtained, and the yields were even higher than after fumigation treatment. Where oats was used as the rotation crop the nematode populations on cotton were reduced during the following season.

In vegetables

Potato cyst nematode: No cysts with live content were found in several cultivated fields in the Bon Accord irrigation area, which was subject to quarantine measures from 1971 to 1973 and planted to potatoes or other host crops only once (1974) since the quarantine period, or not at all. Cysts with live content were found in similar fields in the East Rand, however.

A cyst-forming nematode species previously known only in the USA was found at the Pretoria Golf Club on a green where the grass was not growing well.

Rootknot nematodes: It has been found that when regular fumigation of infested soils with EDB is discontinued and host crops are still grown the nematode population builds up again so that after 14 months 9 per cent of the plants may be infested, and after 19 months 52 per cent.

In vines

Three field experiments in which the response of established sultana vines to treatment with nematocides has been studied have been terminated after five years. Results were somewhat variable. Systemic nematocide granules incorporated into the soil at rates of 5 and 15 kg of active ingredient per ha did not control nematodes or improve plant growth or yield.

In two of the trials an emulsifiable concentrate formulation of DBCP at a dosage of 69 kg a.i. per ha controlled some nematodes, notably *Tylenchulus semipenetrans* for up to 3,5 years. This resulted in increased growth and yield although the latter was only statistically significant in the second season after treatment. In spite of a reduction in nematode numbers the severity of symptoms of growth arrestment disease was not affected, proving that these organisms are not a cause of the disease.

Where granular formulations of DBCP and two systemic nematocides were applied to established Hermitage on Jacquez vines, an EC formulation of DBCP gave better nematode control. This was the only treatment to improve plant vigour within two years of treatment.

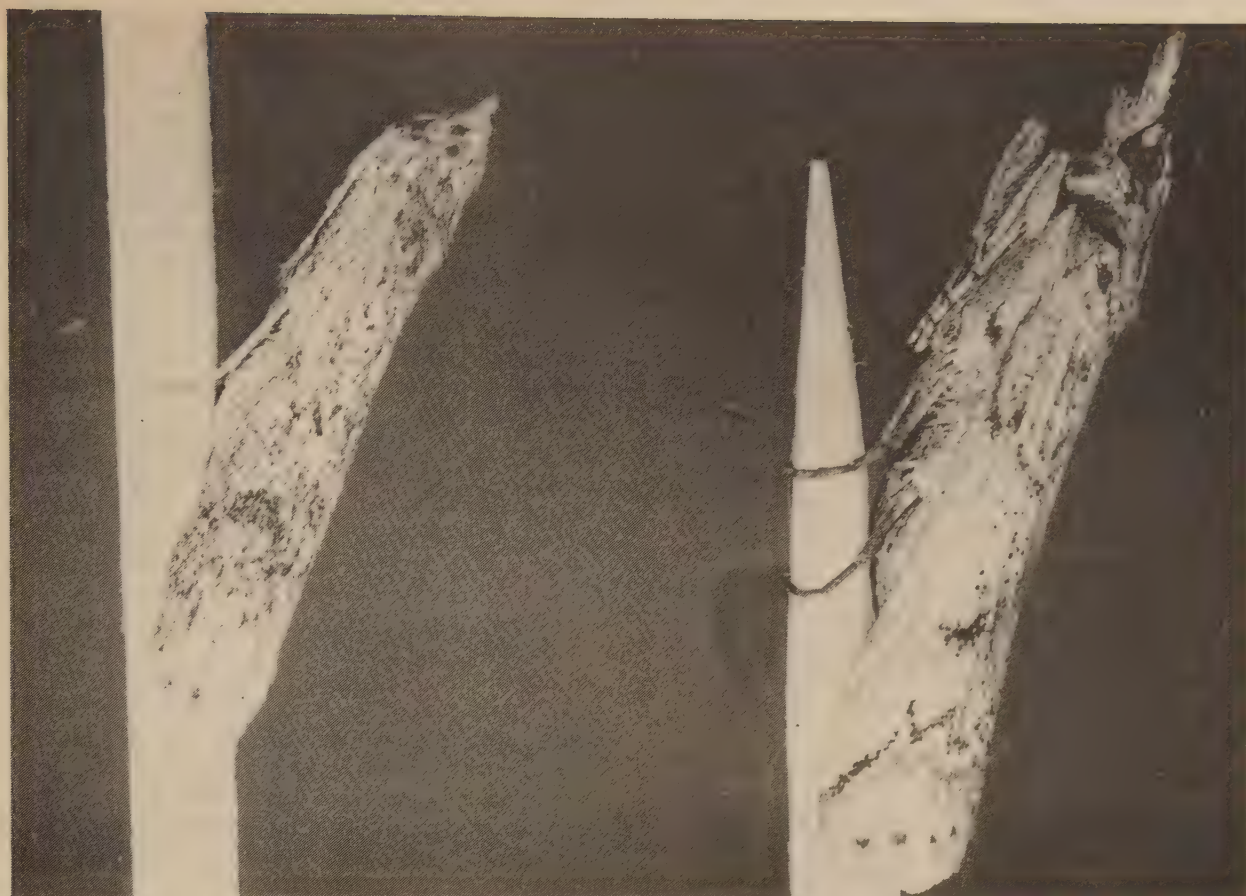
GERBILLES

Experimental work on the control of the *Tatera brantsii* with anticoagulants was continued and indicates that the addition of sulphaquinoxaline increases the efficiency of some of these preparations.

Complaints in connection with gerbilles were received from various areas, including Villiers, Olifantsfontein, Rayton and Witbank. This species also did a great deal of damage to grazing on the Kalahari sandveld.

SPIDERS AND MITES

Studies of the natural enemies of the red spider mite *Tetranychus cinnabarinus* (Boisduval) on strawberries revealed that a spider population of *Pardosa crassipalpis* controlled a population of red



Male and female moth of the jointed cactus borer *Tucumania tapiacola*, recently released against jointed cactus in the Eastern Cape

spider mites so well that there was an increase in the yield. Where the spiders were present the plants showed very little mite damage and grew more luxuriantly. It was unnecessary to apply chemical control for the mites.

Complaints have been received about *T. cinnabarinus* as a pest of vegetables, deciduous fruit and cotton. It was found that one of the organophosphates stimulates the red spider mite to produce considerably more eggs. Spraying cotton with this preparation in the presence of mites could therefore result in a population explosion among the mites.

The two-spotted red spider mite, *T. urticae* Koch, has been reported as a pest of strawberries and flowers. A strain of *T. urticae* collected from strawberries at Roodeplaat has been found to be resistant to propargite (Omite).

Strains of *T. urticae* found on flowers from Krugersdorp and Heidelberg were tested for resistance to aldicarb, but it was found that in both cases this preparation was still able to provide good control of these two strains.

BENEFICIAL INSECTS

BIOLOGICAL CONTROL OF:

JOINTED CACTUS

A reliable sampling programme for jointed cactus, as well as for both its natural enemies *Dactylopius austrinus* and *Cactoblastis cactorum*, was launched in the Eastern Cape in 1975. These long-term quantitative population studies provide insight into the weed/natural enemy relationships and will eventually demonstrate which ecological factors are crucial for the successful biological control of jointed cactus.

The host-specificity studies on the South American moth borer *Tucumania tapiacola* have been completed and permission has been obtained to release the insect on jointed cactus infestations in the Eastern Cape. It has been proved that this new enemy will not become a pest of the cultivated spineless varieties of *Opuntia*.

Mass rearing of this insect is being studied at Grahamstown (Rhodes University) and at Uitenhage. Post-release studies to determine suitable release methods and to monitor the spread of the insect in the field have commenced.

Preliminary host-specificity studies on the Mexican weevil *Metamasius fahrei* which was introduced have shown that it can develop

normally in spineless cactus under quarantine conditions.

IMBRICATE CACTUS

The cochineal insect *Dactylopius tomentosus* which was released on imbricate cactus in 1970 has now also been released on newly discovered infestations in the Steytleville district.

PRICKLY PEAR

The efficiency of the prickly pear stem weevil *Metamasius spinolae* is increasing in the Uitenhage area, 25 years after release. Some heavy infestations at Kruis River, Springfield and Panels Mills have already succumbed to the continuous onslaughts of the insects.

A long-term quantitative survey and sampling programme is being worked out in order to estimate population densities and dispersal of the insects and to evaluate their potential in the biological control of prickly pear.

HAKEA

Colonies of the snout beetle *Erytenna consputa*, which destroys developing seeds, were released during spring in the following areas or mountain ranges: the Cape Peninsula (Silver Mine Plateau, Constantianek, and Chapman's Peak); Stellenboschberg, Helderberg, Botmaskop, Banhoek and Simonsberg in the Stellenbosch area; Lourensford and Sir Lowry's Pass near Somerset West; Kleinrivierberge and Steenboksberg (Caledon); Groenberg (Wellington), Elandskloof (Wolseley), Slanghoek and Badsberg (Goudini); the Du Toit's Kloof, Stettynskloof, Wemmershoek and Franschhoek ranges; Klein-Swartberg (Hoeko); Outeniqua (Molen River), the Outeniqua Pass, the Montagu Pass, Milkwood and Attekwaskloof; Tsitsikamma (Storms River and Kareedouw), and the vicinity of Grahamstown.

Colonies from the various climatic regions of Australia were released in order to observe their adjustment to local conditions. A few colonies have since been destroyed by fire, but progeny was found at almost all the points and the chances that the colonies will establish themselves are fairly good.

About 3 000 larvae of the moth *Carposina autologa*, which attacks full-grown fruit, were placed at 6 different sites, but fire destroyed 3 colonies and mortality was very high elsewhere. Better release techniques are being investigated and a large number of larvae are being bred under artificial conditions. Studies of other insects which may prove valuable are being continued and three species are being studied in quarantine.

Although insects are now being released on a larger scale, the mechanical eradication of hakea will continue to be necessary, since the insects cannot provide an instant solution to the problem. In any case they do not destroy the plants themselves.

SILVERLEAF BITTER APPLE

Research was continued with imported insects. Work on a promising stinkbug from Argentina was discontinued when it was found that the insect is not sufficiently specific for release. A considerable amount of work has been done on the biology and specificity of a new Mexican moth which prevents seed formation in silverleaf bitter apple.

LANTANA CAMARA

The two imported leaf miners *Octotoma scabripennis* and *Uroplata girardi* were established in Natal near Margate. *Lantana* in this area was defoliated in April 1976 by the leaf miners and by *Teleonemia scrupulosa*. Releases of *Leptobyrsa decora*, *O. scabripennis* and *U. girardi* were also carried out at Mt Edgecombe. Previous releases of the leaf miners at Nelspruit and Bugershall have not yet resulted in establishment.

Small numbers of the stem borer *Plagiohammus spinipennis* were released at Sabie River Bungalows and Burgershall. *Teleonemia scrupulosa* has also been observed for the first time from Waterval-Onder to the vicinity of Nelspruit. This sucking insect has also become established in the Tzaneen area, which means that it is rapidly spreading through the Transvaal Lowveld of its own accord.

According to a survey the *Lantana* infestation in the Lowveld covers 13 300 ha at present. *Teleonemia scrupulosa* has spread right up to the area immediately north of East London of its own accord, apparently all along the coast where it was originally released in Natal.

ST JOHN'S WORT

During the year under review the midge *Zeuxidiplosis giardi* showed great promise in the biological control of St John's wort *Hypericum perforatum* near Stellenbosch and at a site near Grabouw. Unfortunately all attempts at establishing *Z. giardi* at Tulbagh have failed, although new methods of releasing the midge will be attempted during the spring.

Chrysolina gemellata is now well established at Tulbagh and still doing well in the Stellenbosch district. Releases of *Chrysolina* were also made at Grabouw, but the release site has subsequently been developed into a sports field and no *H. perforatum* has been found, although this site will be carefully watched to ensure that no further infestations occur.

The root borer *Agrilus hyperici* appeared to adapt favourably to South African conditions, but plants containing *A. hyperici* were defoliated by *Chrysolina*, which resulted in a very high mortality rate. Further supplies will have to be imported to ensure establishment.

AUSTRALIAN ACACIAS

Research on the possibility of controlling Port Jackson *Acacia saligna* and golden willow *Acacia*

cyanophylla by biological means is being continued in Western Australia. Australian insects destroy mainly the seeds of these plants.

POTATO TUBER MOTH

Surveys in fields of table and seed potatoes in the Southern and Eastern Transvaal revealed that 80 to 90 per cent of larvae of potato tuber moth *Phthorimaea operculella* were parasitised during the latter part of the growing season and that larval populations were suppressed to low levels whenever parasitism exceeded 75 per cent. This, together with earlier evidence, indicates that parasitoids exert a major controlling effect on tuber moth infestations. The imported species *Copidosoma koehleri* and *Apanteles subandinus* accounted for over 80 per cent of the parasitoids recorded.

Parasitism tended to be lower where insecticides were used against tuber moth or aphids. The difference was especially marked at the beginning of the season, which may mean that fewer parasitoids are left to survive the winter when insecticides have been applied to the crop. On two farms studied in detail, parasitism at the beginning of the season was 12 per cent where crops had been treated annually against tuber moth and 55 per cent where they had not. At the end of the season, during which none of the crops was treated, parasitism was over 90 per cent in both places and moth damage to the tubers was negligible.

The low parasitoid population on the first farm built up to high numbers in a single season when application of insecticides was stopped. Whether the change-over from chemical to biological control in a single season can be accomplished in all potato-growing areas is a subject for further investigation.

VINE MEALYBUG

During November 1975 small colonies of both the vine and citrus mealybugs, which are closely related, were established in the laboratory. Promising minute parasitic wasps from the Mediterranean area will be tested against these mealybugs in the coming season.

HONEY-BEES

The demands of the more organised and growing bee-keeping industry continue to increase in scope and sophistication.

One reason for this is undoubtedly the stimulus generated by the interest of overseas bee-keepers and research workers in the African honey bee *Apis mellifera edansonii* as a result of the impact its introduction has made on beekeeping in South America. This interest has resulted in Bulletin No. 394 (Bee-keeping in South Africa), which was first released in late 1973, being sold out. An unusually high percentage of the sales were to overseas buyers. The translation of the bulletin was delayed. A list of beekeeping terms in English and Afrikaans has been drawn up and

submitted for use in a dictionary of agricultural terms.

Extension work includes the preparation, at the request of the South African Federation of Beekeepers' Associations, of two film strip series, one on general beekeeping and the other on the specialised topic of pollination. These have not been completed, but the work is well in hand.

A short course was given in conjunction with the Northern Transvaal Beekeepers Association at Pretoria. This was the first short course arranged under the newly adopted system whereby the various beekeepers associations and the Federation are responsible for the initiation and administration of such courses.

At the annual Beekeeping Symposium held in Pretoria in October three talks were given: one on the biology of the Cape honey-bee (R.H. Anderson); one on aspects of the bee-breeding project (B. Buys); and one on nectar flow in boekenhout in relation to weather conditions (M.F. Johannsmeier).

In the course of his research on bee diseases Mr Buys has discovered what appears to be a new disease in honey-bees, namely, brood nosema. A protozoan of the same genus is known to parasitise adult honey-bees but the one discovered here appears to be brood-specific. This discovery has generated considerable interest overseas.

MYCOLOGY

IDENTIFICATIONS

During the year a large number of requests for identification of fungi associated with plants in various ways were received from workers in other Institutes or Regions within the Department as well as from other organisations. A total of 803 fungi were identified.

Among the interesting and economically important species identified during the year were the following: *Colletotrichum acutatum* from decaying strawberry fruit and *Colletotrichum fragariae* from diseased runners of strawberry plants in Pretoria; *Curvularia prasadii* from diseased pine seedlings; from wheat plants from the Springbok Flats affected by foot and root rot, *Sclerotium rolfsii* and *Fusarium equiseti*; from necrotic spots on leaves and stems of sunflower, *Alternaria zinneae* and *Alternaria chrysanthemi*. *Colletotrichum graminicola* caused severe leaf spotting in maize breeding material near Bergville and also occurred in insignificant colonies in other areas. *Phyllosticta maydis*, the cause of yellow leaf blight of maize, was found for the first time on maize in South Africa. Around Delmas extensive leaf spotting occurred, but specimens were also seen from as far afield as Ventersdorp in the Western Transvaal, from the Carolina-Machadodorp areas of the Eastern Transvaal and from Pietermaritzburg.

Although *Phyllosticta maydis* has allegedly been reported from Natal on a previous occasion, the infection from Delmas appears to be the first

authenticated report of this pathogen from South Africa. Its widespread occurrence during the past season indicates a rapid rate of spread under the cool, wet conditions prevalent during the past season.

A virulent strain of *Helminthosporium carbonum* was found on maize from Komatipoort and Pietermaritzburg. Symptoms similar to those caused by *H. maydis* characterise attacks on maize by this fungus and it has been identified from circumstantial evidence as *H. carbonum* Race 3.

CURATORIAL WORK

A total of 52 specimens were added to the Fungus Herbarium to bring the total number of specimens to 45 017. These represent species that have not been recorded before or of which there was insufficient material in the Herbarium.

No specimens were sent out on loan to other workers, but two cultures of fungi have been sent to overseas workers for comments on their identity.

RESEARCH

Seed-borne fungi

Samples of seed from various plants were received for examination for the presence of various pathogenic fungi, and full-scale investigations were carried out on the seed-borne fungi and fungal pathogens of seed of grain sorghum and Japanese radish.

Fusarium moniliforme, *Fusarium graminearum* and *Diplodia maydis* were found on five small samples of maize seed, to the exclusion of other species. Of two samples of rice seed, one was found to be infected with *Pyricularia oryzae* and this fungus was transmitted to a field of rice grown from this seed at Levubu. Action was taken to stop the further distribution of this seed since this was the first occurrence of this fungus in South Africa.

One sample of soya-bean seed was examined and, apart from heavy infection of *Alternaria alternata* on most seeds, a few seeds were found that were infected with an as yet undetermined species of *Ascochyta* and one seed was infected with a small-spored species of *Colletotrichum*. These fungi are being studied further in order to establish their identity.

A study of the seed-borne fungus pathogens of sorghum seed was started during the year. A total of 20 samples of sorghum seed, representing all the main areas of production, were examined according to methods recommended by the International Seed Testing Association.

It was found that the pathogen *Phoma sorghina* was present in 90 per cent of the samples, the rate of infection varying between 13 per cent and 92 per cent of the seeds in each sample. *Fusarium moniliforme* was present in 40 per cent of the samples, mainly those from the South-Western, Western and Northern Transvaal, infecting up to 56 per cent of the seeds in such samples. Other species of *Fusarium*, and *Helminthosporium bicolor*, *H.*

sorghicola and *H. rostratum*, were among the other pathogens present in small numbers in the seeds. *Colletotrichum graminicola* was present in 30 per cent of the samples in small numbers of seeds. Results indicated that *Phoma insidiosa* has an adverse effect on the germination of sorghum seed.

In order to obtain some information on the importance of the seed-borne pathogens in the field, a survey of the diseases of sorghum in the field was undertaken. Leaf diseases caused by *Phoma sorghina*, *Helminthosporium turcicum* and *Colletotrichum graminicola* were found to be prevalent in the Southern Transvaal and Northern Free State, but much less severe on the Springbok Flats. In the latter area downy mildew, caused by *Sclerospora sorghi*, was also found in small percentages of plants in most fields. Head smut, caused by *Sphacelotheca reiliana*, and milo disease, caused by *Periconia circinata*, were found in low numbers in the North-Eastern Free State.

It was therefore clear that a number of important fungus diseases of sorghum are seed-borne, but the causal organisms of certain other diseases, viz downy mildew, head smut and milo disease, were not detected on the seeds by the methods used in examination. However, the seed-borne pathogens, with the exception of *Phoma sorghina*, were carried in such small numbers of seeds that it seems likely that infected crop debris on the surface of the soil in sorghum fields is a much more important source of infection than organisms carried on the seed.

A study of the seed-borne fungal pathogens and their control on Japanese radish was undertaken on 18 samples of seed examined during this year. More than 36 species of fungi were found to be seed-borne on these seeds; *Alternaria raphani* was the most common species. Other pathogenic species in the genus, viz *A. brassicae*, *A. brassicicola* and *A. cheiranthi* were also found quite frequently. *Phoma lingam*, another dangerous pathogen, also occurred on some samples, infecting up to 3,8 per cent of the seeds tested.

Alternaria spp., and especially *Alternaria raphani*, were most commonly isolated from lesions on diseased seedlings, the latter species being most frequently found on lesions on the roots, hypocotyls and cotyledons.

Studies of toxic fungi associated with cattle feeds were continued in collaboration with the Toxicology Section of the Veterinary Research Institute: A total of 89 samples of stock feeds were examined for the presence of species of fungi known to be capable of producing toxic metabolites, in order to determine their geographic distribution. *Pithomyces chartarum* was found on material from various natural and artificial pastures from Piketberg, Stellenbosch, Aberdeen, De Aar, Benoni and Pretoria. This shows that this fungus is far more widely distributed in South Africa than has hitherto been generally believed. *Aspergillus clavatus* was isolated from decaying vegetable material from the Liquari district in Mozambique as well as from chicken rations in the Southern Transvaal, and *Fusarium moniliforme* was found

on beans from the Transkei as well as in maize and other fodder samples from Kroonstad, East London, Queenstown, Humansdorp, Middelburg (CP), Delareyville, Pretoria and Windhoek. All these latter samples were associated with cases of suspected mycotoxicosis of farm stock.

A study of the fungi associated with the grass *Cenchrus ciliaris* was started during the year. To date, species from approximately 100 genera have been found on these specimens. The genera of which the largest number of species were present include *Helminthosporium*, *Curvularia*, *Periconia*, *Alternaria*, *Trichoderma* and *Myrothecium*. Few of these are associated with lesions on the leaves; most fungi seem to be present on the senescent leaves and leaf litter.

The results obtained so far indicate the existence of relationships between the rainfall and numbers of fungi on the various surfaces, the numbers of fungi present in different parts of the litter and the relative numbers of species present at different times of the year. Parts fully exposed to sunlight yield dark-coloured species, whereas hyaline fungi are isolated on shaded parts. However, these results permit of tentative conclusions only - final conclusions will only be possible after the survey has been continued for a full year.

POTATO VIRUS RESEARCH

Two new potato cultivars, Kimberley Choice and Late Harvest, have fared well so far. About 500 tons of seed of the former and somewhat less of the latter were produced commercially during the year.

PLANT VIRUS RESEARCH

An investigation of the incidence and distribution of viruses in deciduous fruit orchards and vineyards was continued. A survey of commercial pome orchards in the Western Cape confirms the poor phytosanitary condition of apple and pear orchards.

Multiple infections of up to six viruses were detected in the principal cultivars Golden Delicious, Granny Smith, Starking and White Winter Pearmain. In tests no apple cultivar was found to be free of virus infection.

Although only two viruses were tested for, the pear cultivars Beurré Hardy, Bon Chrétien, Packham's Triumph and Doyenne du Comice showed similar results. This underlines the necessity of heat treatment in the plant improvement scheme for deciduous fruit in order to eliminate virus infection.

A preliminary survey of virus diseases in cherries in the Eastern Free State confirms the widespread occurrence of two pollen-borne viruses which lower production and quality. These findings emphasise the necessity of virus-free propagation material and the establishment of new plantings under isolation. In this area good progress has

already been made in the establishment of heat-treated material.

The economic importance of virus infection in table grape plantings is emphasised by the discovery that the rootstock Jacquez, the principal rootstock in the cultivation of table grapes, is extremely susceptible to strains of stem-grooving.

The progressive deterioration of a Queen of the Vineyard clone selection trial on Jacquez, which already shows a 17,2% strength infection with stem-grooving six years after grafting, is reflected in an average crop decrease of 23,3%, a figure which would be much higher if the symptom-free vines which served as controls had been virus-free. The association of leafroll and corky bark with stem-grooving makes the occurrence of this complex an extremely important factor in the cultivation of table grapes.

Good progress has, however, been made in the eradication of viruses in table grape clone selections, and heat-treated material from the main table grape cultivars is already being virus indexed. This material should be available to the South African Plant Improvement Organisation within the next three years, provided it passes the phytosanitary and ampelographic tests.

The only virus disease that can spread naturally in South African vines, viz fanleaf, occurs widely in wine grape plantings. Investigations into the disease being transmitted in the soil by the nematode species *Xiphinema index*, which occurs locally, are now being conducted. Attempts are also being made to reclaim infected vineyard soils permanently.

The heat treatment of clone selections of deciduous fruit and vines under the plant improvement programme was continued and 39 clone units were established. Because of the occurrence of heat-stable strains, particularly of leafroll in vines, an attempt is now being made to obtain virus-free shoot tips under conditions favourable to virus multiplication and translocation. This technique of shortened heat-treatment (7 days as against 150 days or more) will be of great value to the industry if it can lead to the elimination of virus indexing after heat treatment.

The presence of a filamentous virus with a length of 700 nm was detected in bramble, which belongs to the Rosaceae. This is the first time a similar virus has been detected in *Rubus*, an event which aroused great interest abroad. A possible connection with similar viruses in pomes is now being investigated.

The serological tracing and identification of viruses in deciduous fruit is receiving special attention because of its importance regarding imported plant material. The non-endemic viruses arabis mosaic, raspberry ringspot and an almond leafspot virus were detected serologically. Investigations concerning the identity of the latter virus are in progress.

LEGUME RESEARCH

The Plant Protection Research Institute is continuing to evaluate the effectiveness of inoculating economically important legumes. The first thing which is determined is to what extent a legume is capable of supplying its own nitrogen requirements if it is inoculated with selected *Rhizobium* strains. The Institute also determines whether rhizobia suitable for a legume occur in soils where the legume is cultivated. If this is the case, the Institute determines whether inoculation is worthwhile.

Thus far, results indicate that groundnuts and cowpeas are generally well nodulated by rhizobia in the soil and that little is gained by inoculation in extensive cultivation practices. Inoculation is advisable under more intensive conditions of cultivation, however. No indigenous *Rhizobium* bacteria for soya-beans occur in South African soils and seed should be inoculated properly, especially if it is planted in soil where nodulated soya-beans have not previously been grown. Certain indigenous *Rhizobium* strains, which can in fact nodulate on soya-beans, do not fix nitrogen and merely parasitise the plants.

Results indicate that the inoculation of beans such as *Phaseolus vulgaris* and *Phaseolus multiflorus* is not to be recommended at this stage. Even with the best selected *Rhizobium* strains the nitrogen fixing period for beans appears to be too short to meet the plant's requirements. In addition, problems are experienced in obtaining good nodulation with inoculation and various cultivars are specific as regards their *Rhizobium* requirements. Farmers should not depend on inoculation to obtain optimum yields.

Rhizobium strains for economically important legumes, which were specially selected for South African conditions, were again supplied to manufacturers of inoculants this year. The manufacturers are obliged to use these strains in inoculants. The quality of the locally produced inoculants was outstanding. Out of 76 batches of inoculant tested by the Institute this year, only three were declared unfit for marketing, even though the minimum number of *Rhizobium* bacteria required had been increased to 5×10^8 /g of inoculant. These inoculants compare favourably with the best in the world.

Rhizobium strains are now also available for the manufacture of inoculants for rooibos tea, should this be desired. In addition, wide-spectrum *Rhizobium* strains, giving satisfactory results with unselected *Trifolium africanum* and *Trifolium luehliianum*, were also isolated.

An investigation of the effect of fungicides, which are applied to seed, on rhizobia with which the seed is inoculated shows that all fungicides are harmful to the nodule bacteria to a greater or lesser extent. However, the results confirmed that Thiram is the least harmful fungicide and that Thiram-treated seed can be inoculated successfully.

PHYTOSANITARY SERVICES AND RESEARCH

ENTOMOLOGY SECTION

GENERAL

The primary responsibility of the Entomology Section is to trace, identify and eliminate any harmful organisms that may reach the country with imported plant material. Imported plant material is thoroughly examined on receipt for exotic nematodes, mites and insects. Recommendations on the further treatment of the material are made on the basis of its phytosanitary condition. Attention is given to the phytosanitary care of plants during the quarantine period.

The Section also co-operates closely with the Division of Plant and Seed Control, chiefly by providing a diagnostic service. Professional services are also rendered for the purposes of the Agricultural Pests Act in respect of nurseries, orchard sanitation, the phytosanitary certification of plant materials for export, etc. The Section is also concerned with the establishment of various plant improvement schemes.

Research on problems in the strawberry industry and the prevention and elimination of nematode vectors in irrigation water is also undertaken on a limited scale.

The Section's activities are:

THE ADMINISTRATION OF THE ORCHARD AND CULTIVATED PLANTS CLEANSING ACT

During the year samples are handed in by inspectors for the identification of scales and mites proclaimed under the Orchard and Cultivated Plants Cleansing Act. When an identification has been made and spraying efficiency determined the Division of Plant and Seed Control is able to apply this Act meaningfully.

During the past year 392 samples were received from deciduous fruit producers from all the proclaimed areas for evaluation for pernicious scale. The accompanying table shows the results of the laboratory investigation.

Species	Identification		Total
	Live	Dead	
Pernicious scale			
<i>Quadraspidiotus perniciosus</i>	133	16	149
Grey scale			
<i>Diaspidiotus africanus</i>	14	2	16
Red scale			
<i>Aonidiella aurantii</i>	3	0	3
Unidentifiable specimens		224	224
Total			392

A large number of specimens could not be identified, chiefly because the insects had been dead for too long.

In addition to the diagnostic service a spraying programme was worked out in co-operation with the Fruit and Fruit Technology

Research Institute, and duplicated for distribution to deciduous fruit producers.

In four cases live populations of pernicious scale were found on fruit offered for export during the export season. In these cases the producers were refused phytosanitary certificates.

Orchard sanitation in respect of the European red mite was continued during the past year and 75 leaf samples were received for diagnosis. Live *Panonychus ulmi* infestations were found in two cases only. Common red spider *Tetranychus cinnabarinus* was common on all samples, however. A revised spraying programme was drawn up in co-operation with the FFTRI for distribution to producers within the proclaimed areas.

IMPORTED MATERIAL

During the year under review 81 samples, consisting chiefly of imported graftwood, were microscopically examined in the laboratory. A widespread incidence of European red mite (*Panonychus ulmi*) eggs in the material was found. Isolated infestation of peach silver mite *Aculus cornutus* were also found on *Prunus* spp. from the USA. *Aculus schlechtendali* was found on apple graftwood from the USA and England in two cases.

Infestations traced in imported material during the past years are reflected in the table below.

French apples were imported into the RSA in January 1976. Random samples taken from these apples were examined in the laboratory for insect infestation. Three mite species, viz *Tetranychus* spp., *Tydeus* spp. and *Tarsonemus setifer*, were found in the calyx ends of the apples. Eggs of the European red mite *Panonychus ulmi* were common on the apples, in numbers varying from 1 to 30 per apple.

The procedure for disinfecting imported material laid down in the FAO standards was

applied during the past year, i.e. cyanide gas (HCN) fumigations were replaced with methyl bromide fumigations. It was found that the success of the fumigations and the phytotoxicity after fumigation with methyl bromide depend chiefly on the humidity of the environment in which the fumigation is carried out and the degree of physiological rest enjoyed by the plants.

The nematological examination of flower bulbs, ornamentals, etc., was transferred to the Plant Protection Research Institute in Pretoria in July 1975. Forty two samples - mainly dahlias and orchids - were examined in June 1975. *Aphelenchoides* spp. were very generally found. *Pratylenchus* was also identified in begonia bulbs from Holland. Spiral nematodes were found in orchids from Australia and *Ditylenchus* spp. in several consignments of dahlias from Holland. The one consignment of dahlia bulbs from the USA was clean.

Eleven samples of rice seed were examined for infestation by *Aphelenchoides besseyi*, the causative organism of white tip disease of rice. Although a technique specifically intended for this nematode was applied, no nematodes could be recovered.

Thirty samples of lucerne seed were examined for stem nematode *Ditylenchus dipsaci*, which is a serious pest of lucerne overseas. *Ditylenchus* spp. were found in only one sample and *Aphelenchoides* spp. in four samples. The lucerne seed was imported by the Lucerne Seed Control Board after last year's floods and consequent failure of the crops of local producers.

ESTABLISHMENT OF THE FOUNDATION BLOCK AT FLEURBAAI

In view of the establishment of the foundation block the question of the possibility of virus transmission of the NEPO virus group by nematodes was raised. To find the answer to this

Date	Crop	Cultivar	Origin	Harmful organisms traced
75.08.11	<i>Ceratonia siliqua</i>	Carob, locust bean	Greece	<i>Aspidiotus hederae</i> (oleander scale)
75.12.17	<i>Prunus spinosa</i>	M111		<i>Panonychus ulmi</i> European red mite eggs
	<i>Prunus spinosa</i>	M112		
	Prunus	St. Julian	France	
		D'Orleans		
75.10.03	Ribes	Gelbe Triumph	Switzerland	<i>Pratylenchus</i> nematodes
	Rubus	Zeva 2	Switzerland	Spiral nematode, larvae only
75.11.28	Prunus	St. Julian (Pollizo)	Spain	<i>Panonychus ulmi</i> eggs
76.01.09	Olive	Mission	USA	Curculionidae
				Coleoptera
76.01.20	Malus	Charden	France	<i>Panonychus ulmi</i> eggs
	Malus	Blackjon	France	<i>Panonychus ulmi</i> eggs
76.02.06	Prunus	4E471	USA	<i>Aculus cornutus</i> peach silver mite
76.02.06	Prunus	2E420	USA	<i>Aculus cornutus</i> peach silver mite
76.02.16	Vines	Vranac	Yugoslavia	<i>Panonychus ulmi</i> eggs
76.02.17	Apples	Lord Lambourne	England	<i>Tarsonemus</i> spp. mites
				<i>Aculus schlechtendali</i> mites
76.02.17	Apples	Alkmene	W. Germany	<i>Panonychus ulmi</i> eggs
76.02.24	Apples	Gloster 69	W. Germany	<i>Panonychus ulmi</i> eggs
76.03.20	Apples	Golden Delicious	New Zealand	<i>Panonychus ulmi</i> eggs
				<i>Aculus schlechtendali</i>
76.03.15	Prunus	Inra Prunier	France	<i>Panonychus ulmi</i>

question, it was decided to investigate the irrigation dam at Fleurbaai systematically for the presence of plant-parasitic nematodes. Twenty samples a week are examined over a distance of ten metres along the bank. Each sample represents 20 l of water. Two hundred and forty samples have been analysed since the project was started. Free nematodes are regularly found in water, but so far only two species of plant-parasitic nematodes have been recovered, viz *Paratrichodorus acutus* and *Hemicyliophora labiata*.

A survey was also undertaken in the foundation block to determine what plant-parasitic nematodes occur there and whether *Xiphinema* spp. are present. Thirty soil samples have already been examined in the course of the survey. No *Xiphinema* spp. have been traced as yet, but it has been established that isolated specimens of *Tylenchorhynchus* spp., *Pratylenchus* spp., ring nematodes and spiral nematodes occur. If infested trees are treated in good time it may be possible to rid the orchard of plant-parasitic nematodes. This is particularly desirable in the case of the lesion nematodes *Pratylenchus* spp. and ring nematodes *Criconeimoides* spp. *sensu lato*, since these groups are known to impair the growth of the trees in time.

The Section was also involved in the installation of a Thomas tube filter in the irrigation line between the irrigation dam and the foundation material. Several laboratory tests were carried out to determine whether *Xiphinema* spp. nematodes are able to penetrate layers of diatomaceous earth of varying thicknesses in cross-section as well as the nylon filter-sleeve. It was found that a diatomaceous earth layer 5 mm thick is fairly effective in preventing the penetration of nematodes, but that the nylon sleeve alone would not effectively remove nematodes from the irrigation water.

PHYTOSANITARY CARE OF PLANT MATERIAL AT THE QUARANTINE STATION

A comprehensive spraying programme was compiled; it included both material under quarantine and material on the plot. The spraying programme corresponds largely to that of the Fruit and Fruit Technology Research Institute, with certain modifications in respect of the gauze cages and glasshouses. The modifications were necessary since certain pesticides cause scorching when applied at the recommended concentrations.

Researchers also concentrated on the correct treatment of imported material on reception. In future more methyl bromide fumigations will be carried out in accordance with the FAO standards where environmental conditions determine the dose and the duration of a fumigation and where humidity can be artificially controlled to keep phytotoxicity to a minimum.

A series of trials was undertaken to determine the correct procedure for the methyl bromide fumigation of soil mixtures used for

containerisation. The correct dose and period of treatment, at which nematodes and most of the weed seed will be killed, were determined. It was established that this treatment is also effective for eradicating nematode eggs.

An inspection scheme for imported material was designed in co-operation with the Plant Pathology Section; this scheme will make it possible to evaluate the phytosanitary status of the material at regular intervals from reception to release.

STRAWBERRY PLANT IMPROVEMENT SCHEME

In addition to the research and the survey on strawberries already carried out, nematode infestations were followed up at the premises of growers of certified material. The effectiveness of methyl bromide when heated before application was followed up. Although some interesting observations have already been made, the project is not yet complete.

LITERATURE BANK, NEMATODE COLLECTION AND IMPROVEMENT OF TECHNIQUES

Considerable progress has been made in the collection of background literature to the laboratory's activities. A nematode reference collection which will form the basis for nematological work has been started. The collection already consists of about 50 identified slides of the chief plant parasites encountered during the past year.

All the recovery techniques applied in the laboratory at present have been standardised. This means that the most suitable techniques for phytosanitary purposes are used, which makes the recovery of nematodes independent of the person applying the technique.

The sugar flotation/centrifuging technique will in future be used for all soil samples with specific screening and centrifuging periods that make the recovery of widely divergent nematode species (from *Xiphinema* to *Pratylenchus*) possible.

RESEARCH ON PLANT PATHOLOGY

Soil-borne nursery diseases came in for special attention; the aim was to investigate possible new methods of control which might eventually be incorporated in the nursery regulations. The widespread incidence of *Phytophthora cinnamomi* root rot was established in vine nurseries, especially in the Wellington area; the disease was found to occur chiefly in the rootstock Richter 99. Over 50 per cent of the nurseries investigated were found to be infected. It was possible to isolate the organism only in soils on which infected vines were growing, which indicates the importance of soil as a source of infection.

In an attempt to eliminate crown gall infection of nursery material, an investigation into the possibility of testing nursery soils for the

presence of crown gall bacteria *Agrobacterium tumefaciens* in advance has been started. Although laboratory tests with selected media appear to be very successful, rapid identification of the organism remains a stumbling block in large-scale tracing studies.

NEW PLANT QUARANTINE FACILITIES AT BUFFELSPOORT

Approval was obtained in 1975 for the extension of quarantine and phytosanitary services to the north of the country, and the development programme for the provision of glasshouses, buildings and other facilities at the Buffelspoort experimental farm has reached an advanced stage. A ten-year development programme has been submitted and funds have been voted by the Department for the erection of the first two glasshouses during the present financial year.

Approval for increasing the staff at Buffelspoort has been obtained and the first plant pathologist has already assumed duty. The present staff at Buffelspoort - a chief technician, farm foreman and technical assistant - have been included under Phytosanitary Services. It will be possible to start the phytosanitary evaluation of plant material in quarantine next spring.

One of the primary goals of phytosanitary services is to give advice on diseases and pests that do not occur in the RSA. The development and maintenance of a data bank are of cardinal importance for the efficient performance of this task. A data bank section, whose sole function will be the collection of data, has therefore been established.

With the establishment of quarantine facilities at Buffelspoort for field crops, vegetables and other horticultural crops, development programmes for the tracing, identification and elimination of plant viruses and other systemic diseases are being planned.

HANDING OVER FOUNDATION MATERIAL

The first wine grape cultivars to meet the phytosanitary requirements for foundation material were handed over to the Oenological and Viticultural Research Institute during the past year for ampelographic evaluation and eventual release to the KWV plant multiplication organisation. Twelve cultivars were handed over, including important local red varieties such as Cinsaut and Gamay noir and white varieties such as Colombard, Clairette blanche, Weisser Riesling 239 and Grenache blanc.

The second group of deciduous fruit cultivars, consisting of 11 pome and 10 drupe cultivars, which met the phytosanitary requirements for foundation material were made available to the South African Plant Improvement Organisation (SAPO), subject to pomological evaluation by the Fruit and Fruit Technology Research Institute. This brings the total number of pome and drupe cultivar clone selections which meet the phytosanitary requirements for foundation material to 91.

In addition, the first table grape rootstock cultivars were issued to SAPO for the establishment of foundation blocks on the organisation's farm Excelsior in the Kouebokkeveld.

It was a red letter day when the first foundation material produced by SAPO was handed over to the South African Nurserymen's Association. The presentation took place on 18 June 1976 at the Quarantine Station of the Plant Protection Research Institute at Stellenbosch.

On this occasion the first State-certified super grade propagating material of the plum rootstock Marianna was presented to the Chairman of the South African Nurserymen's Association by the Minister of Agriculture.

AGRICULTURAL TECHNICAL RELATIONS WITH FOREIGN COUNTRIES

CO-OPERATION WITH AFRICAN COUNTRIES

SARCCUS conferences and meetings attended

Nature of meeting	Time	Place	SA delegates
Meeting of Subcommittee for Land Use Planning	1975-07-28 to 1975-07-30	RSA	Dr J. Serfontein Mr H.S. Niehaus Dr D.M. Scotney
Meeting of Standing Committee for Animal Production	1975-09-16 to 1975-09-18	RSA	Dr L. Mostert
Meeting of Standing Committee for Animal Health	1975-09-16 to 1975-09-18	RSA	Dr J.H. Hofmeyr Dr P.R. Mansvelt Dr J.P. van der Merwe
Meeting of Standing Committee for Soil Conservation and Land Use Planning	1975-09-22 to 1975-09-26	RSA	Dr D.J. Agenbach Dr M.E.L. Buys Dr H.C. Hahne Dr D.M. Scotney Mr T.J. Kotze
Meeting of Standing Committee for Plant Protection	1975-10-07 to 1975-10-09	RSA	Dr I.H. Wiese
Meeting of Standing Committee for Plant Production	1975-10-07 to 1975-10-09	RSA	Dr A.J. Pienaar
Meeting of Subcommittee for Seed	1975-10-07 to 1975-10-09	RSA	Mr J.F. van Wyk
Meeting of Subcommittee for Phytosanitary Control	1975-10-07 to 1975-10-09	RSA	Mr D.C. Lourens

Meeting of Subcommittee for Agricultural Engineering	1975-10-13 to 1975-10-15		Rhodesia Mr J.J. Bruwer
Meeting of Standing Committee for Nature Conservation, Wild Life Utilisation and Control	1975-10-21 to 1975-10-23	Malawi	Dr P.R. Mansvelt
Meeting of Standing Committee for Soil Science	1976-01-13 to 1976-01-15	RSA	Dr C.N. MacVicar
Meeting of Subcommittee for Aquatic Weeds	1975-10-30	RSA	Dr I.H. Wiese Dr D. Edwards

Visitors from African countries

Name of visitor	Country and institution	Period of visit	Purpose of visit	Institutions visited
Mr Atkinson	Swaziland	1 day	Integrated control of citrus pests	Plant Protection
Dr B. Blair Dr J. Falconer	Rhodesia Botswana; Director of Veterinary Services	1 day 1976-02-03	General discussions Discussions on importation requirements and in transit importation of meat from the Lobatsi abattoir	Plant Protection Veterinary Services
Dr S. Walshe Dr B. Bretton	Botswana; Veterinary Services officials	1976-02-03	Discussions on importation requirements and in transit importation of meat from the Lobatsi abattoir	Veterinary Services
Miss Kay Flattery Mr B. Masia	Botswana Lesotho	1 day 1975-07-18	Work on microscope Discussion on regulations and seed legislation	Plant Protection Plant and Seed Control
Mr J. Momson-Low	Tanzania	1975-08-19	Discussion on exportation of vegetable crops from the Republic	Plant and Seed Control
Mr B.B. Mtawali	Malawi; Secretary for Agriculture	1975-09-08 to 1975-09-13	Discussions on general organisation of the Department, wheat and maize production and stock development	Head Office, Onderstepoort, Transvaal Region, etc.
Mr K. Nohan	Japan; Plant Inspector	1975-08-07	Discussions on the exportation of citrus to Japan	Plant and Seed Control
Mr Richets	Swaziland	November 1975	Study tour	Swellendam (Winter Rainfall Region)
Dr J.T.R. Robinson	Rhodesia; Inspector of Department of Veterinary Services	1975-08-18 to 1975-08-25	Discussions on meat hygiene and abattoirs	Veterinary Services and Onderstepoort
Mr Springfield	Rhodesia	1975-10-23	Visit to pasture section concerning crop re-research	Welgevallen (Winter Rainfall Region)
Dr Williamson	Rhodesia	1975-07-22 to 1975-07-23	To discuss recent outbreak of foot-and-mouth disease in Rhodesia and negotiate on international traffic in animals and animal products	Veterinary Services
Mr K.B. Hanssen	Rhodesia	1976-04-13	Discussion on seed	Plant and Seed Control

Visitors to African countries

Purpose of visit	Date	Place	SA officer(s)
To visit abattoirs and meat processing factories	1975-10-29 to 1975-11-15	Rhodesia, Botswana, Swaziland	Dr J.D. Coetzee
To investigate various aspects of plant protection and cultivation of tobacco	1976-01-18 to 1976-01-24	Rhodesia	Mr R.J. van Wyk
To attend the Limnology Congress	1975-09-09 to 1975-09-13	Rhodesia	Mr C. Musil
To attend the International Aloe Congress	1975-07-14 to 1975-07-20	Rhodesia	Mr D. Hardy
To investigate abortion in cattle	July 1975	Rhodesia	Dr A.P. Schutte
To lecture on spices at the University of Rhodesia	August 1975	Rhodesia	Mr A.J. Joubert
To investigate material plantings	1975-09-25 to 1975-09-27	Rhodesia	Dr A.J. Pienaar
To accompany the party deputed by the Langeberg Co-operative to investigate the Torrie process of vegetable dehydration	1975-10-15 to 1975-10-17	Rhodesia	Mr G.W. Reddek
To visit SARWEIN wheat plantings	1975-11-10 to 1975-11-13	Malawi	Dr D.J. Rossouw

To investigate the occurrence of leaf roll virus in exported seed potatoes	1975-10-13 to 1975-10-15	Mauritius	Mr D.C. Lourens
To investigate the occurrence of brucellosis among cattle	1975-09-16 to 1975-09-21	Réunion	Dr A.P. Schutte Dr H.S. Seaton
To investigate animal health and quarantine facilities on the island	1975-11-02 to 1975-11-06	Réunion	Dr P.R. Mansvelt Dr J.P. van der Merwe Dr J.H. Hofmeyr
To give advice on the cultivation of maize and the improvement of varieties	1975-07-27 to 1975-08-01	Réunion	Mr H.O. Gevers
To discuss the establishment of a Red Locust Control Organisation	1976-02-03 to 1976-02-06	Rhodesia	Dr I.H. Wiese Dr H.D. Brown Mr L.J. Botha
To collect dung beetle species for dispatch to Australia	1976-01-11 to 1976-01-21	Rhodesia	Mr A.L.V. Davis

OVERSEAS VISITS

Congresses, meetings and symposia

Meeting	Time	Place	SA delegate
Annual meeting of the OECD seed certification authorities	March 1976	France	Mr J.F. van Wyk
14th International Congress on Refrigeration (IIR)	September 1975	Russia	Mr L. Ginsberg
8th Annual Conference of the Nematological Association	July 1975	USA	Dr. D.L. Milne
Conference on sweetcorn breeding Sweetcorn Breeders' Association Meeting, Research Conference - Hybrid Corn Industry	November/December 1975	USA	Dr W.P. Grobbelaar Mr C. Kuhn
3rd International Virology Congress Eucarpia Congress	1975-09-10 to 1975-09-17 September 1975	Spain France	Dr D.W. Verwoerd Mr H.O. Gevers
Acted as Chairman of the International Symposium on Clostridia in Paris and visited animal science institutes	1975-09-08 to 1975-10-02	England, USA, Israel, France	Dr B.C. Jansen
International Symposium on ULV Spraying	1975-09-12 to 1975-09-27	England	Mr N.H.S. Pretorius
International Committee Meeting for the Standardisation of Banana Leaf Analyses	1975-08-24 to 1975-08-31 Canary Islands		Mr W. Langenegger
Inaugural Congress for an International Groundnut Programme	July 1975	USA	Dr J.W. Snyman
American Peanut Research Congress	September 1975	USA	Mr J.P.A. van der Merwe
3rd International Barley Genetics Symposium	1975-07-06 to 1975-07-12	Germany	Dr B.E. Eisenberg
International Soya Bean Congress and negotiations for inclusion in INTSO Programme	1975-07-18 to 1975-08-08	USA	Dr J.W. Snyman Mr H.W. Kaiser
EARP Congress	September 1975	Netherlands	Mr F.I. du Plooy
Congress on Game Diseases	1975-08-26 to 1975-08-31	Germany	Dr H. Ebedes
Symposium on ectoparasites among cattle	1975-08-25 to 1975-08-30	USA	Miss J.B. Walker
Symposium of the International Tobacco Association	1975-10-04 to 1975-10-12	Spain	Mr H.G. Snyman
OIV Meeting and discussions with OIV Secretariat	1975-09-08 to 1975-09-20	France	Dr J.D. Burger Dr J. Deist
59th Annual meeting of the International Dairy Federation	1975-09-21 to 1975-09-25	Austria	Mr J.J. du Toit
Read paper at the Biennial Congress of the Australian Society of Animal Production and addressed some of its branches	1976-02-04 to 1976-02-22	Australia	Dr J.H. Hofmeyr
Meeting at Long Ashton on weather and plant productivity and critical development conditions for plants	1976-04-13 to 1976-04-16	England	Dr. H. Tormann
International Clay Conference AIPEA in Mexico, and related study tours	1975-07-08 to 1975-10-01	Mexico, USA Canada, England	Mr R.W. Fitzpatrick
ACTIM Symposium on Water and Agricultural Activities	1976-03-01 to 1976-03-13	France	Dr P.C. van Rooyen

Study tours and official visits

Purpose of tour/visit	Date	Place	SA officer
Study of plant breeders' rights, germ plasm and seed testing	1975-06-25 to 1975-07-22	France, England, Netherlands, West Germany, Italy	Mr A.J. Cronje

Investigation of nitrogen fixation in grasses	1975-07-20 to 1975-08-18	Uruguay, Brazil, Argentina	Dr J.L. Staphorst
Investigation of world trends in vegetable breeding, breeding for increased mechanisation, improvement and practical breeding	1975-07-10 to 1975-08-17	USA	Mr J.J.B. van Zyl
Study of the stone-fruit, table-grape and wine industries	1975-08-31 to 1975-10-01	France, Germany, USA	Mr A.F. Kriel
Study of burrowing nematode and insects in citrus and subtropical fruit	1975-07-27 to 1975-09-04	USA and Hawaii	Dr D.L. Milne
Investigation of problems experienced in providing advanced extension	1975-09-02 to 1975-10-02	USA	Mr F.K. Shone
Study of mechanisation of blood-group testing, reagent production and administration of the stud book industry	1975-09-01 to 1975-09-30	England, Scotland, France, Germany, Italy	Mr S.J. du Plessis
Investigation of Savannah ecosystem research, syntaxonomy and ecological classification systems	1975-09-07 to 1975-10-09	France, Switzerland, Austria, Germany, Netherlands, Belgium	Dr J.C. Scheepers
Investigation of the planning of irrigation schemes and into agricultural extension in irrigation areas	1975-07-16 to 1975-08-12	USA	Mr E. Verster Mr H. Hamman
Investigation of new developments and techniques in the application of soil physical chemistry in the evaluation of irrigable land and irrigation water and the use of knowledge gained on soil physical and pedological classification characteristics in the effective utilisation of soil	1975-10-18 to 1975-11-30	USA and Israel	Mr H.M. du Plessis Mr J.L. Hutson
Acting as guide and interpreter to Cape Pomological Association on its fruit production study tour of South America	1975-11-10 to 1975-12-08	South America	Mr A.P. Fresno
Investigation of labour and cost-saving aspects of tobacco cultivation	1975-07-04 to 1975-08-02	USA and Canada	Dr M.P. Lamprecht
Investigation of experimental animal facilities at experimental animal centres	1975-09-16 to 1975-10-14	Greece, Germany, The Netherlands, France	Dr J.L. du Plessis
Visit to maize breeding stations	1975-09-08 to 1975-10-02	Italy, Spain, Germany	Mr H.O. Gevers
Investigation of engineering aspects of tobacco research	1975-07-04 to 1975-08-02	USA and Canada	Mr J.F. Fuls
Visits to researchers and institutes about soil analysis and tests	1975-09-05 to 1975-10-03	USA	Dr M.P.W. Farina
Investigation of the organisation of irrigation matters and the nature of extension activities in irrigation area, and attendance at the International Course on Rural Extension at Wageningen	1975-06-03 to 1975-08-02	The Netherlands, Germany, England, Denmark, Italy, Israel	Mr G.W. Oosthuizen
Investigation of extension organisation	1975-10-10 to 1975-11-08	Australia	Mr C.R. Baard
Investigation of aspects of oenological, viticultural and engineering aspects	1975-09-06 to 1975-10-19	France and USA	Mr A.S. Zeeman Mr A. Haak Mr G.W.W. Wagener Mr O. Bergh
Investigation of the deciduous fruit canning industry	June/July 1975	Spain	
Study of cellar technology	1975-08-27 to 1975-09-23	France, Germany Italy	Dr D. Joubert Mr C. van Rooyen
Investigation into the decentralisation of services from Government level to semi-Government level and the private sector	1975-09-20 to 1975-10-18	Germany, France The Netherlands	Dr J.E. Erasmus Dr J.D. Slabber
Collecting of insects for hakea research	1975-05-28 to 1975-07-11	Australia	Dr S. Nesor
Study of citrus fruits	1975-09-01 to 1975-09-30	Argentina Brazil	Dr J. Moll
Study of breeding techniques and mechanisation trends at breeding stations	1975-06-01 to 1975-09-30	The Netherlands	Mr L.A.S. Robertson
Visits to soil and leaf analysis laboratories	1975-08-23 to 1975-09-09	England, The Netherlands, Germany	Mr W. Langenegger
Study of groundnut production techniques	1975-09-11 to 1975-10-16	USA	Dr J.W. Snyman
Investigation of mechanical harvesting and artificial ripening of groundnuts	1975-09-11 to 1975-10-16	USA	Mr J.P.H. Landsberg

Study of genetics and breeding of groundnuts and sunflowers	1975-09-11 to 1975-11-02	USA	Mr P.J.A. van der Merwe
Investigation of release of patented cultivars, attending of UPOV work meeting and study of bitterpit	1975-06-15 to 1975-07-18	France, Greece, The Netherlands, Germany	Dr A.J. Heyns
Study of latest techniques and quality determining methods and building up of contacts for genetic material	1975-07-06 to 1975-08-06	Germany, Austria, Denmark, Sweden, The Netherlands, France, England	Dr B.E. Eisenberg
To lecture at Adelaide University	1975-08-18 to 1975-09-05	Australia	Dr J.E. van der Plank
Study of control practices regarding Nassella tussock grass	1975-10-04 to 1975-12-08	Australia, Tasmania New-Zealand, Chile, Peru, Argentina, Uruguay, Brazil	Mr M.J. Wells
Study of potato breeding	1975-09-04 to 1975-09-29	The Netherlands, West Germany, France	Mr F.I. du Plooy
Investigation into the freeing of seed potatoes from tuber-borne diseases	1975-09-04 to 1975-09-30	England, Scotland	Mr A.C. Jandrell
Visits to agricultural counsellors to discuss their activities and to investigate the expansion of agricultural technical liaison and co-operation	1975-09-25 to 1975-09-12	USA, Canada, England, West Germany, France	Dr W.A. Verbeek
Investigation of quality control of dairy products	1975-08-30 to 1975-10-03	England, Scotland, The Netherlands, Austria, Germany	Mr J.J. du Toit
Visit to Iowa University at the invitation of the Statistical Laboratory and Department of Statistics of that University	1975-12-01 to 1976-01-31	USA	Dr C.Z. Roux
Collecting design data for special quarantine glasshouses for maize diseases	1975-09-12 to 1975-09-29	USA	Mr J.F. van Staden
Visit to Burroughs B7700 computer systems and carrying out of norm tests	1976-01-02 to 1976-01-17	USA, England, Holland, Luxemburg, Germany	Mr G.J. Smit

ATTENDANCE AT SYMPOSIA, CONGRESSES, ETC., AND STUDY TOURS

The following table reflects the number of visits by officers of the Department to African and overseas countries and the expenditure involved, during the past six financial years:

Financial year	Visits to African countries	Visits to overseas countries	Departmental expenditure R	Funds provided by Boards and other bodies R	Total expenditure R
1970/71	66	56	40 100	20 700 (a)	60 800
1971/72	51	75	45 100	18 600 (b)	63 700
1972/73	90	53	39 730	15 000 (c)	54 730
1973/74	56	62	60 610	30 380 (d)	90 990
1974/75	40	89	114 200	27 700 (e)	141 900
1975/76	20	91	107 790	40 985 (f)	148 775

- (a) Expenditure in respect of 24 officers is not included here since in their case all costs were borne by the body that invited them and no figures are available
- (b) Ditto in respect of 19 officers
- (c) Ditto in respect of 22 officers
- (d) Ditto in respect of 19 officers
- (e) Ditto in respect of 19 officers
- (f) Ditto in respect of 16 officers

SCIENTIFIC AND OTHER VISITORS

Name of visitor	Country and institution	Period of visit	Purpose of visit	Institutions visited
Dr D.E. Alexander	University of Illinois, USA	3 weeks during March/April 1976	Attendance at maize symposium and evaluation of Departmental maize breeding programmes, etc.	Crops and Pastures, Natal Region

Mr J. Allen	Australia	1975-08-20	Visited Wool Section to become acquainted with working methods	Karoo Region
Annual Graziers Tour of the World (farmers)	Australia	1975-07-04	Tour of inspection	Onderstepoort
Party of Americans (32 persons)	USA	1975-11-17	Tour of inspection	Elsenburg
Party of Austrians (29 persons)	Austria	1975-11-14	Study tour of the RSA	Veterinary Services
Dr T.L. Barber	Anthropod-bonne Animal Disease Research Laboratory	Seven weeks during July/August 1975	To gain experience in bluetongue virus typing	Veterinary Services
Dr Bashaw	USA	1976-02-05 to 1976-04-15	Seed collecting tour through the Republic, mainly grasses	Plant and Seed Control, Crops and Pastures, Natal, Karoo, OFS Regions
Dr P. Becker	Germany	1 day	Act 36/1974 (discussion of registration)	Plant Protection
Mr J. Birch	Australia	1975-11-06	Tour of inspection	Outeniqua Experimental Farm
Prof. F. Bigi	Italy	1975-07-07	Discussions on agricultural policy and problems of a general nature in agriculture	Head Office (discussions with SDS(P))
Dr G. Binder	Italy	1975-09-04	General information on the seed industry, legislation, etc.	Plant and Seed Control
Mr J.P.M. Brenan	England; Deputy Director of the Royal Botanical Gardens	1976-01-29 to 1976-02-20	To inspect the National Herbarium and gain insight into the organisation of the Institute	Botany
Dr Brown	Eire; veterinarian from Dublin	1975-11-24	Tour of inspection	Onderstepoort
Dr Gaynor	Eire; veterinarian from Dublin	1975-11-24	Tour of inspection	Onderstepoort
Mr L.C. Brown	England	1975-10-20	Discussions with Pasture Section	Welgevallen
Mr Buckley	England	1975-11-01 to 1975-11-30	Study of Plant Ecology in RSA	Worcester Veld Reserve
Mr G. Burge	Australia	1975-10-08	Discussions and tour of inspection	Elsenburg; Caledon; Outeniqua Experimental Farm
Mr B. Campocasso	France; Director of GIE	1975-08-22	Discussions on the exportation of apples from France to RSA	Plant and Seed Control
Mr P. Vernet	France; Technical Director of GIE	1975-08-22	Discussions on the exportation of apples from France to RSA	Plant and Seed Control
Mr Alberto E. de las Carieras	Argentina; President of the Argentinian Meat Industry	1976-03-17	To stimulate interest in the World Meat Congress	Veterinary Services
Mr Chiltern	England	1975-11-05	To enquire about diseases of horses and stock in the RSA	Veterinary Services
Mr R. Coy	England (Marketing Manager of Messrs Charles Sharpe)	1976-03-22	Seed exportation, etc.	Plant and Seed Control
Party of Germans (55 persons)	Germany	1975-10-26	Part of tour "History Club"	Worcester
Mr B. Duytschaever	Belgium	1975-11-12	Act 36 of 1947	Plant Control
Dr Ewalt	USA	2 days	Discussions on citrus thrips	Plant Protection
Dr D.H. Geymonat	Uruguay; Director of Veterinary Services	1975-07-20 to 1975-08-08	To study the organisation of Veterinary laboratory and field services	Veterinary Services, Animal and Dairy Science, Transvaal Region
Mr C.B. de la Girodey	Réunion	1976-02-02	Breeding of poultry	Animal and Dairy Science
Mr Goede	USA	November 1975	Tour of inspection	Outeniqua Experimental Farm

Group of farmers from Canada	Canada	1976-02-12	Tour of inspection	Veterinary Services
Group of French horticulturists	France	1975-11-24	Discussions	Horticulture
Group of American farmers (21 persons)	USA	1975-11-24	Tour of inspection	Onderstepoort
Group of 24 Germans	Germany; members of Arbeitsgemeinschaft für Pharmazeutische Verfahrenstechnik	1975-10-14	Tour of inspection	Onderstepoort
Dr M. Gunzberg	Belgium	1975-09-22	Discussions on research	Onderstepoort
Prof. R. Goeden	USA	1 week	Biological control of weeds	Plant Protection
Dr Haertel	Germany; Director of Veterinary Services of Bavaria	1976-01-08	Investigation into the stock diseases control position and the system applied by the Division	Veterinary Services
Mr R.G. Haines	USA	1975-08-13	Act 36 of 1947	Plant Protection
Mr J. Hardy	USA	1975-08-05	Act 36 of 1947	Plant Protection
Dutch Touring Group	The Netherlands	1975-11-21	Tour of inspection	Elsenburg
Dr Jim Hoy	New Zealand	3 days	Establishment of research unit at Uitenhage	Plant Protection
Italian scientists	Italy; Fruit Research Institute, Rome	February 1976	To gather information on fruit cultivation and processing	Fruit; Horticulture; Natal Region
Mr E.P. Kappel	Germany	1975-09-04	Act 36 of 1947	Plant Protection
Mr G.D. Kelly	Canada	1975-12-04	Vegetable seed production	Plant and Seed Control
Dr J.M. King	USA; Department of Pathology, Cornell University	4 to 5 months from the beginning of 1976	Post-graduate experience at the Pathology Division	Onderstepoort
Mr W. Knolle	Germany	1975-10-18	Visited Crops Section in connection with seed improvement	Welgevallen (Winter Rainfall Region)
Mr T.B. Kobayashi	Japan	1975-07-28	Arranged exportation of citrus to Japan	Plant and Seed Control
Mr Lindley	Switzerland	1 day	Act 36 of 1947	Plant Protection
Dr Loutersweiler	Germany	1 day	Act 36 of 1947	Plant Protection
Dr Luzane	USA	1975-10-23	Act 36 of 1947	Plant Protection
Mr A. Mahan	Australia	2 days	General discussions	Plant Protection
Mr Josef Maerz	Germany	1976-01-08	Discussions on possible establishment of a meat processing factory in the RSA	Veterinary Services
Prof. and Mrs P. McMahon	Australia; University of New South Wales	1975-08-04 to 1975-08-08	Discussions on animal science	Animal and Dairy Science
Mr Smith McQueen	England	1 day	Act 36 of 1947 (discussion of registration)	Plant Protection
Dr Wendy Milne	Australia	1 week	Biological control of citrus scale	Plant Protection
Mr K. Mohara	Japan; Plant Inspector	1975-08-07	Discussions on exportation of citrus to Japan	Plant and Seed Control
Dr A. Oakes	USA; Senior Research Agronomist of the Germplasm Resources Laboratory	1976-02-05 to 1976-04-15	Collecting of plants and seeds	Crops and Pastures; Natal, Karoo and OFS Regions
Prof. H.P. Olmo	USA	1975-10-16	Investigation of vineyard cultivation in the Olifants River Irrigation Scheme	Vredendal
Mr G. Passfield	Australia	1975-07-19	Discussions on general phytosanitary matters	Plant and Seed Control
Mr F.A. Pastor	USA	1975-07-03	Act 36 of 1947 (discussion on registration)	Plant Protection

Mr K.G. Pegg	Australia; Senior Plant Pathologist of the Department of Primary Industries	1975-08-28 Citrus 1975-09-02 Horticulture	To inquire into diseases of sub-tropical fruit and vegetables	Citrus and Horticulture
Mr Brian R. Pitkin	England	1975-08-11 to 1975-08-23	Thrips taxonomy	Veterinary Services
Mrs Linda Pitkin	England	1975-08-11 to 1975-08-23	Orthoptera collection	Plant Protection
Mrs Pivont	Belgium	1975-08-13	Tour of inspection	Onderstepoort
Dr Plumb	USA	1975-11-24	Tour of inspection	Onderstepoort
Mr Yoel Pruginin	Israel; from the Fish Culturist Extension Service	1975-09-22 to 1975-09-27	Tour of fisheries in Eastern Transvaal; gave lecture to officials of AE & M and Transvaal Provincial Administration	Transvaal Region
Dr J.C. Raeber	Switzerland; representative of Ciba-Geigy	1976-03-16 to 1976-03-17	Investigation into the possibility of establishing a seed and breeding firm here	Plant and Seed Control
Dr R.E. Reichard	USA; Animal and Plant Health Inspection Service	1975-07-15 to 1975-08-15	Inspection of meat export installation of Messrs Hirsch & Co.	Veterinary Services
Mr R. Reynolds	USA	1975-10-14	Crops Section	Welgevallen
Dr C. Richaud	Mauritius; Head of Plant Diseases Section of the Sugar Research Institute	1976-03-15 to 1976-03-23	Read paper at Maize Symposium	Natal Region
Mr Ritterhaus	Austria	November 1975	Tour of inspection	Welgevallen (Winter Rainfall Region)
Mr R.L. Schauer	USA	1975-10-16	Act 36 of 1947 (discussion on registration)	Plant Protection
Mr P. Scheider	Switzerland	1 day	Act 36 of 1947 (discussion on registration)	Plant Protection
Dr Shuja	Mauritius; Director of Meat and Marketing Board	1976-01-12	Discussions on veterinary requirements for slaughter cattle exported to Mauritius	Veterinary Services
Mr Niel Sistek	USA	1975-08-13	Tour of inspection	Veterinary Services
Mr W.V. Sthamer	Germany	1975-10-23	Act 36 of 1947 (discussion on registration)	Plant Protection
Messrs. Orlando Sobero and Edward Grados	Peru	1975-08-04	Investigation into the organisation of the wool and mohair industries in the Republic	Karoo Region
Dr E. Tal	Israel; Director of National Council for Research and Development of the Office of the Prime Minister	1976-03-23 to 1976-04-08	Discussions on scientific collaboration and possible exchange of scientists	Viticulture; Soil; Horticulture; CSIR, etc.
Dr S. Lavee	Israel; Head of Institute of Horticulture of the Agricultural Research Organisation	1976-03-23 to 1976-04-08	Discussions on scientific collaboration and possible exchange of scientists	Viticulture; Soil; Horticulture; CSIR, etc.
Mr V.Y. Saphir	Israel; Deputy Director of National Council for Research and Development of Israel	1976-03-23 to 1976-04-08	Discussions on scientific collaboration and possible exchange of scientists	Viticulture; Soil; Horticulture; CSIR, etc.
Mr W. Thomas	New Zealand	3 months	Study of parasites and the black maize beetle	Plant Protection

Dr Tincknell	England	1 day	Act 36 of 1947 (discussion of registration)	Plant Protection
Mr Valentine	Australia	November 1975	Study of the black maize beetle	Outeniqua Experimental Farm
Mr M. van Essen	The Netherlands	1975-09-15	Tour of inspection	Elsenburg (Winter Rainfall Region)
Mr H. von Reibnitz	Germany	1975-11-26	Hybrid maize seed production	Plant and Seed Control
Prof. E. Watson	Australia	1975-11-17	Discussions on grain breeding and diseases	Welgevallen Experimental Farm

REPRESENTATION ABROAD

The following table gives statistical particulars of the activities of the various overseas representatives of the Department during the year under review.

Nature of activities		Europe	Washington	Buenos Aires	Canberra
1.	Visits to research institutes, farms, experimental farms, etc.	149	38	51	64
2.	Conferences and meetings attended	53	20	19	13
3.	Special investigations reported on	18	82	8	3
4.	Reports and publications supplied to the Department and other organisations in the RSA	4 215	6 131	110	546
5.	Number of visitors from South Africa -				
	(a) for whom itineraries were drawn up and the main arrangements made	101	28	95	7
	(b) to whom general assistance was given	81	16	150	8
6.	Interviews granted to non-South Africans	233	16	250	14
7.	Bursary students and other South African students assisted	10	15	5	-
8.	Material consigned to South Africa -				
	(a) plant material (number of cultivars and/or individual seed samples)	64	1 706	55	503
	(b) animal material	A large number of units of bull semen, as well as the semen of various meat goats			
9.	Newsletters compiled and sent to the Department	8	22	6	12

ADMINISTRATIVE MATTERS

ESTABLISHMENT

POSTS

An indication is given below of the posts in the Department (in the respective Divisions into which the posts are divided in the Public Service) as at 30 June 1976, as well as of the number of vacancies in each Division, compared with the corresponding period for the previous year:

Division	Authorised posts	1975.06.30		Authorised posts	1976.06.30	
		Vacant posts			Vacant posts	
		Number	%		Number	%
	164	9	5,5	163	9	5,5
Administrative	481	32	6,7	494	51	10,3
Clerical	1 494	190	12,7	1 501	236	15,7
Professional	1 586	31	2,0	1 609	197	12,2
Technical						

General A	85	2	2,4	84	10	11,9
General B	2 216	209	9,4	2 220	330	14,9
Non-classified	171	8	4,7	150	28	18,7
Posts additional to the authorised establishment	107	88	82,2	106	82	77,3
Total	6 304	569	9,0	6 327	943	14,9

Increase/Decrease in the number of authorised posts in the various classifications over the past 5 years:

Division	1972.06.30	1973.06.30	1974.06.30	1975.06.30	1976.06.30	Total % increase or decrease
Administrative	135	145	155	164	163	+20,7
Clerical	465	475	478	481	494	+ 6,2
Professional	1 715	1 691	1 583	1 494	1 501	-12,5
Technical	1 534	1 544	1 566	1 586	1 609	+ 4,98
General A	86	86	86	85	84	- 2,3
General B	2 296	2 221	2 324	2 216	2 220	- 3,3
Non-classified	323	286	174	171	150	-53,6
Total	6 554	6 448	6 366	6 197	6 221	- 5,1

Note: Non-classified posts do not include posts additional to the establishment.

IMPORTANT ORGANISATIONAL AND ESTABLISHMENT CHANGES

Training in viticulture, pomology and vegetable production at the Elsenburg College of Agriculture, together with the lecturing posts at the Oenological and Viticultural Research Institute, the Fruit and Fruit Technology Research Institute and the Horticultural Research Institute, was transferred to the Winter Rainfall Region, as from 1 July 1975.

In order to activate and co-ordinate crop research in the Department to greater purpose, it was finally decided to place the centres for summer grain and small grain, under the technical control of the Crops and Pastures Institute, this being done with effect from 1 January 1976 and 1 March 1976, respectively.

The Directorate of Agricultural Technical Services was made smaller on 1 October 1975. The post of Senior Deputy Secretary (Professional) and the six posts of Chief Director were replaced by four regraded posts of Chief Director. The posts of Director, Deputy Director, Assistant Director (Veterinary Services), Chief Engineer and Assistant Chief Engineer were likewise regraded.

The control of the Groot Constantia Government Estate was transferred from the Department to the Groot Constantia Board of Control on 1 January 1976.

The Faculty of Agriculture at Pietermaritzburg was removed from the Department's establishment on 1 January 1976. The lecturing and technical staff were taken into the employ of the local university on the same date.

The South-Western Districts Extension Subregion in the Winter Rainfall Region was renamed the South Coast Extension Subregion on 1 February 1976.

At the Veterinary Research Institute (Onderstepoort) the Vaccine Preparation Section was given a Division status on 1 March 1976 and its establishment was suitably reinforced.

STAFF GAINS AND LOSSES

Division	1974.07.01-1975.06.30			1975.07.01-1976.06.30		
	†Gains	*Losses	%	†Gains	*Losses	%
Administrative	6	15	-150,0	16	16	-
Clerical	162	150	+ 7,4	187	167	+10,7
Professional	148	218	- 47,3	144	191	- 32,6
Technical	331	270	+18,4	259	311	- 20,1
General A	12	12	-	12	12	-
General B	751	702	+ 6,5	738	773	- 4,7
Non-classified	92	90	+ 2,2	70	92	- 31,4
Total	1 502	1 457	+ 3,0	1 426	1 562	- 9,5

†By "gains" is meant all persons gained by every Division, i.e. appointments from outside, promotions and translations from one Division to another, and transfers from other Departments.

*By "losses" is meant all persons lost by various Divisions (individually or jointly), including translations and promotions to other Divisions and cases where persons left the service for good, such as resignations, deaths, retirements, abscondences and dismissals.

STAFF CHANGES (SENIOR STAFF)

RETIREMENTS

The following senior officers retired from the service of the Department after a long career, on reaching the age limit:

Name	Rank	Institution to which attached	Years of service	Date of leaving service
Mr S.W. Walters	Chief Director	Directorate of Agricultural Technical Services	34 years	1975.12.31
Dr J.H.B. Viljoen	Deputy Director	Division of Veterinary Services	39 years	1975.12.31
Dr J.D. Smit	Deputy Director	Veterinary Research Institute	34 years	1976.02.29
Dr P. de la Harpe	Assistant Director	Division of Veterinary Services	23 years	1975.09.30
Mr T.G. la G. Joubert	Assistant Director	Horticultural Research Institute	38 years	1976.03.31
Dr P.P. Hugo	Assistant Director	Division of Veterinary Services	36 years	1976.05.31
Mr N.J. van Straaten	Chief Engineer	Division of Agricultural Engineering	20 years	1976.04.30

PROMOTIONS

Name	Rank to which promoted	Institution	Date promotion became effective
Dr A.D. Nieuwoudt	Director	Soil and Irrigation Research Institute	1975.07.01
Dr L. Mostert	Director	South West Africa Region	1975.07.01
Dr P.W. Roux	Director	Eastern Cape Region	1975.07.01
Mr D.F. de Wet	Director	Crops and Pastures Institute	1975.07.01
Dr W.P. Grobbelaar	Deputy Director	Highveld Region	1975.07.01
Dr J.P. Jooste	Deputy Director	Professional Auxiliary Services Panel	1975.07.01
Mr T.E. Skinner	Deputy Director	Crops and Pastures Institute	1975.07.01
Dr D.J. Rossouw	Deputy Director	Tobacco Research Institute	1976.01.01
Dr J.D. Coetzee	Deputy Director	Division of Veterinary Services	1976.01.01
Dr T.W. Naudé	Deputy Director	Veterinary Research Institute	1976.04.01
Dr P.J. Gous	Assistant Director	Oenological and Viticultural Research Institute	1976.01.01
Mr I.G. Venter	Assistant Director	Plant Protection Research Institute	1976.02.01
Dr B. van D. Boshoff	Chief Engineer	Division of Agricultural Engineering	1976.05.01

BURSARIES

The bursary scheme administered by the Department with funds donated by the various control boards was continued during 1975/1976. Bursaries are awarded for the full periods of study, which may vary from one year to four years.

The following table shows the number of bursaries awarded since 1972 and their monetary value:

	NUMBER OF BURSARIES			
	New grants	Total	Studies completed	Total monetary value of new bursaries awarded (R)
Grants up to 1972	34	149	25	59 200
Grants up to 1973	46	170	32	98 200
Grants up to 1974	33	171	24	77 600
Grants up to 1975	45	192	28	118 000
Grants up to 1976	38	202	34	98 000

During 1976 no bursaries were awarded for post-graduate study at local universities.

The following table shows the number of officers released from service for post-graduate study at local universities since 1972:

Year	1972	1973	1974	1975	1976
B.Agric.(Hons.)(Inst./Agrar.)	14	12	6	7	4
B.Sc.(Agric.)(Hons.)	-	-	-	38	8
Master's Degree	40	39	31	-	-
Doctorate	-	1	-	-	-

As regards advanced scientific training, a number of promising officers are studying overseas.

The following table shows the number of officers who have completed their overseas studies since 1972 or will complete them shortly:

Year	1972	1973	1974	1975	1976
Number	4	5	5	5	3

A sum of R5 000 was granted to 20 needy students taking the diploma course at the various colleges of agriculture.

TRAINING OF AGRICULTURAL TECHNICIANS

A new course in Soil Science was introduced as from January 1976 for the training of technicians for the Soil and Irrigation Research Institute. During 1975 approval was also granted for technicians of the Animal and Dairy Science Research Institute (Division of Dairy Research) to follow the more suitable course in Food Technology instead of the course in Zoology.

10. Annexures

(1) ORGANISATION AND FUNCTION OF THE DEPARTMENT

(a) HEAD OFFICE OF THE DEPARTMENT

Agriculture Building, cor. Beatrix Street and
Soutpansberg Road, Private Bag X116, Pretoria,
0001

Secretary - Dr W.A. Verbeek

Administrative Management

Senior Deputy Secretary (Administrative) - Mr
B.W. Viljoen
Deputy Secretary (General Auxiliary Services) - Mr
L.J. Botha
Deputy Secretary (Personnel and Training) - Mr
A.J. Schoonwinkel
Deputy Secretary (Technical and Legal Affairs) -
Mr B.J. Dreyer
Under-Secretary (Sundry) - Mr M.D. Meyer
Under-Secretary (Personnel Administration) - Mr
P.M.A. Spreeth
Chief Work Study Officer - Mr G.P. Kleinhans
Under-Secretary (Data Processing) - Mr G.J. Smit
Under-Secretary (Technical Administration) - Mr
A.C. Bosch
Under-Secretary (Statutory Control) - Mr. C.J.
Wessels
Under-Secretary (Acts and Parliamentary) - Mr
C.S. de Villiers
Under-Secretary (External Affairs) - Mr G.M.
Botha
Under-Secretary - (Programme Planning and
Estimates) - Mr H.F. van Zyl
Chief Accountant - Mr P.B. de Klerk
Assistant Chief Accountant - Mr J.J. Lombard

Directorate of Agricultural Technical Services

Chief Director (Chairman) - Dr D.W. Immelman
Chief Director - Dr D.J. Agenbach
Chief Director - Dr J.C. Strydom
Chief Director - Prof. S.A. Hulme
Chief Director - Dr B.C. Jansen

Panel Professional Auxiliary Services

Director - Dr A.D. Nieuwoudt (Sub-directorate:
Co-ordination of Irrigation)
Deputy Director (Biometry) - Dr J.P. Jooste
Assistant Director (Biometry) - Vacant
Assistant Director (Training) - Dr N.J. Robbertse
(Division of Agricultural Information)

Assistant Director (General Auxiliary Services): Dr
E. Verster (Soil and Irrigation Research
Institute), Mr A.C. van Niekerk (CPO)
(Horticultural Research Institute), Mr P. v.d.
M. Bruwer (Soil and Irrigation Research
Institute) and Mr H.C. Kühn (CPO)
(Highveld Region)

Crops and Pastures Institute

Director - Prof. A.J. Pienaar

Deputy Director - Mr T.E. Skinner

Assistant Directors: Dr J.W. Snyman and Dr V.D.
Wasserman (Chief Professional Officer)

The Institute does not itself engage in research but
gives guidance to research workers engaged in
research in the different regions on summer
grain, winter grain, other agricultural crops,
pastures and pasture crops, and co-ordinates
all research in this connection. The
co-ordination of weed and poisonous plants
research at the national level, as well as
supplying technical information in connection
with weedicides, is also a function of the
Institute.

Departmental Inspectorate

Departmental Inspector (Professional) - Mr H.J.
Kriek

Departmental Inspector (Professional) - Vacant

(b) FOREIGN REPRESENTATIVES

Agricultural Attaché (London) - Mr C.S. Hawkins
(Counsellor, Agricultural Technical) (South
African Embassy, South Africa House,
Trafalgar Square, London W.C. 2N5DP,
England)

Agricultural Attaché (Paris) - Dr J.G. Boyazoglu
(First Counsellor, Agricultural Technical)
(South African Embassy, 59 Quai D'Orsay,
75007, Paris, France)

Agricultural Attaché (Washington) - Dr A.D.
Venter (Counsellor, Agricultural-Scientific)
(South African Embassy, 3051 Massachusetts
Avenue, Washington D.C. 20008, USA)

Agricultural Attaché (Buenos Aires) - Mr G.J.
Carstens (Counsellor, Agricultural Technical)
(South African Embassy, Avenida Marcelo T.
de Alvear 590-8 Pisco, Buenos Aires,
Argentina)

Agricultural Attaché (Canberra) - Mr P.F. du Toit
(Counsellor, Agricultural Technical) (South

African Embassy, Rhodes Place, Yarrulumba,
Canberra ACT 2600, Australia)

(c) RESEARCH INSTITUTES

Soil and Irrigation Research Institute

Belvedere Street, Private Bag X79, Pretoria, 0001

Director - Dr M.C.F. du Plessis

Deputy Director (Chemical Analysis and Soil
Survey and Regulatory Services) - Dr P.F.
Fuls

Deputy Director (Irrigation Research, Agricultural
Meteorology and Agricultural Land
Development) - Dr C.N. MacVicar

Assistant Directors:

(Chemical analysis and Regulatory Services) -
Dr C.E.G. Schutte;

(Soil Survey) - Vacant

(Irrigation Research) - Mr G.C. Green;

(Agricultural Meteorology) - Dr M.E.L. Buys;

(Agricultural Land Development) - Mr J.
Myburgh - Seconded to Agricultural Credit
and Land Tenure.

The Institute is responsible for the classification
and mapping of the soils of the Republic, as
well as for basic research at national level in
respect of the physical and chemical
characteristics of soils. In addition, soil
surveys are undertaken for irrigation projects
and the investigation of physical soil
characteristics where brack and waterlogging
conditions occur. The Institute, on behalf of
other Government departments, provincial
administrations and other bodies, also
undertakes the chemical analysis of soil, water
and plant material. Furthermore, the
Institute, in terms of Act 36 of 1947,
undertakes the inspection and analysis of
fertilisers, stock feeds, stock remedies and
agricultural remedies. The Institute is
responsible for the planning, co-ordination
and control of irrigation research carried out
by and/or in co-operation with the Regions
and Institutes and has also been designated to
undertake agricultural evaluations and
planning of irrigation areas. Another task of
the Institute is the collection, processing and
interpretation of meteorological data for
agricultural purposes.

Plant Protection Research Institute

Agricultural Building, Beatrix Street,
Private Bag X134, Pretoria, 0001

Director - Dr I.H. Wiese

Deputy Director - Dr D.P. Annecke

Assistant Director (Entomology/Zoology) - Dr
J.J.C. Nel

Assistant Director (Combating of Locusts) - Mr
I.G. Venter

Assistant Director (Phytosanitary Services) - Mr
H.P. van Heerden

Assistant Director (Plant Pathology/Microbiology)
- Dr B.W. Strydom

The Institute is broadly responsible for advanced
research and research at the national level on
plant pathology, insect and animal pests and
their control. This includes microbiology,
taxonomy of fungi, identification of virus
diseases, the freeing of propagating material
from viruses, honey-bees, insects in stored
grain, forest and timber insects, taxonomy of
insects and nematodes, economic zoology,
toxicology of insecticides and the biological
control of insect pests and weeds. The
Institute is also responsible for the
examination and control of imported plant
material and the control of migratory locusts.
The Institute uses the research stations and
experimental farms at Rietondale (Pretoria),
Buffelspoort (Marikana), Fleurbaix and the
quarantine station (Stellenbosch), as well as
the research units for the control of prickly
pear and jointed cactus at Uitenhage and
forest pests at Rosebank (Cape Town).

Botanical Research Institute

Private Bag X101, Pretoria, 0001

Director - Dr B. de Winter

Deputy Director - Dr D.J.B. Killick

Assistant Director - Dr D. Edwards

The Institute undertakes basic research on the flora
and vegetation of South Africa with emphasis
on taxonomy, morphology, ecology and
economic botany. The Institute also controls
the Botanical Garden at Brummeria (Pretoria)
and herbaria in Durban, Grahamstown,
Kimberley, Pretoria, Stellenbosch and
Windhoek.

Citrus and Subtropical Fruit Research Institute

Private Bag 11208, Nelspruit, 1200

Director - Dr J.H. Grobler

Deputy Director - Mr A. van Oostrum

Assistant Director - Dr D.L. Milne

The Institute is responsible for country-wide
research on all aspects of the citrus and
subtropical fruit industry, as well as nuts, tea,
coffee and herbs.

The Institute also undertakes research on the
research stations and experimental farms
Addo (Eastern Cape), Burgers Hall, Citrusdal,
East London, Friedenheim, Levubu (Louis
Trichardt) Messina, and Rustenburg.

Tobacco Research Institute (Kroondal)

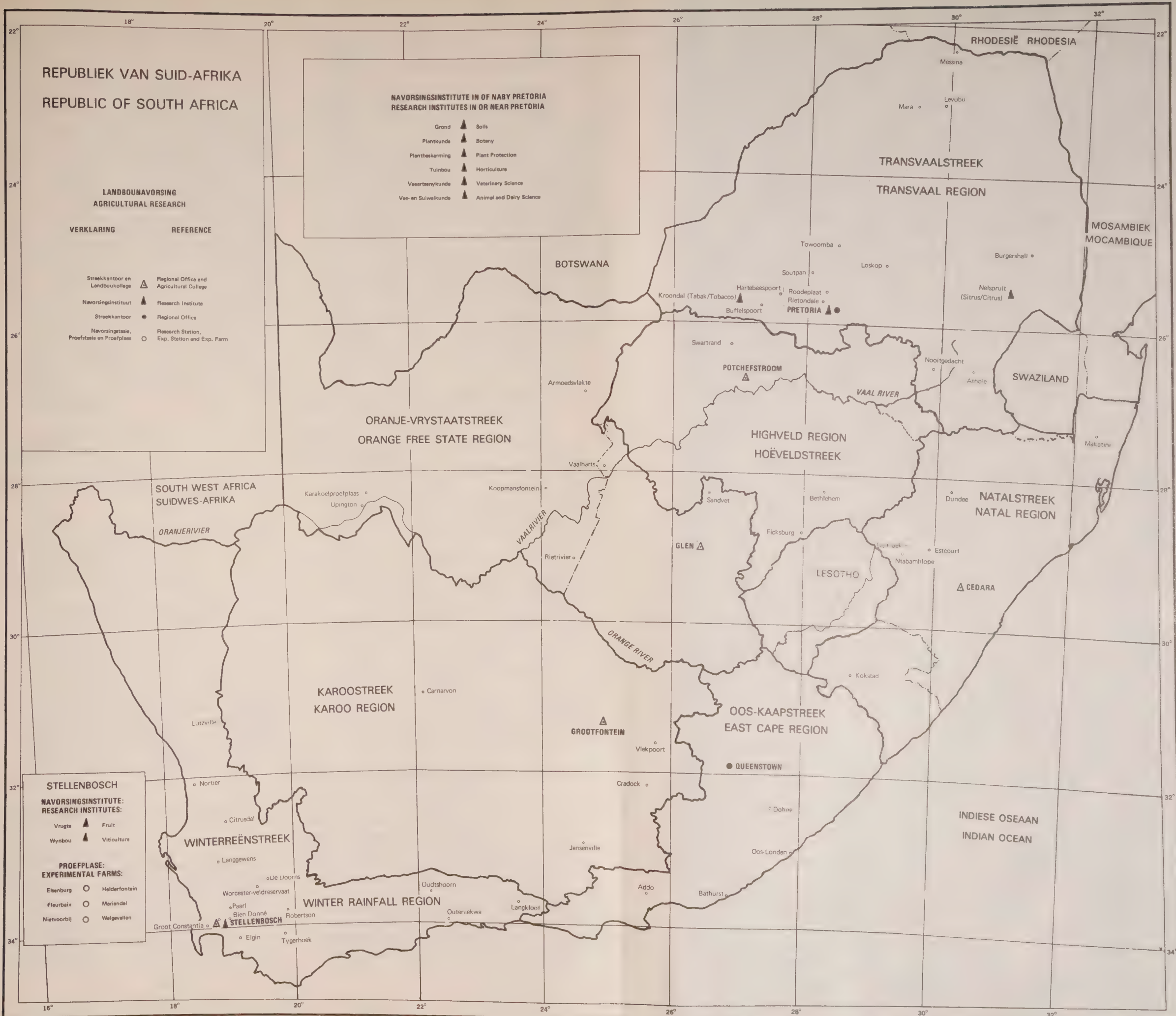
Private Bag, Rustenburg, 0300

Director - Mr J.F. Peens

Deputy Director - Dr D.J. Rossouw

Assistant Director - Dr M.P. Lamprecht

The Institute is responsible for research, including
technological aspects, in the interests of the
tobacco industry in all parts of the country.
The Institute also undertakes research work
on research stations and experimental plots at
Groblersdal, Hartebeespoort (Brits), Nelspruit,
Oudtshoorn, Potgietersrus and Stellenbosch.



REPUBLIEK VAN SUID-AFRIKA
REPUBLIC OF SOUTH AFRICA

NAVORSINGSINSTITUUT IN OF NABY PRETORIA
RESEARCH INSTITUTES IN OR NEAR PRETORIA

LANDBOONAVORSING
AGRICULTURAL RESEARCH

VERKLARING

REFERENCE

- | | | |
|---|---|---|
| Streekkantoor en
Landboukollege | ▲ | Regional Office and
Agricultural College |
| Navorsingsinstituut | ▲ | Research Institute |
| Streekkantoor | ● | Regional Office |
| Navorsingstasie,
Proefstasie en Proefplaas | ○ | Research Station,
Exp. Station and Exp. Farm |

- | | | |
|---------------------|---|--------------------------|
| Grond | ▲ | Soils |
| Plantkunde | ▲ | Botany |
| Plantbeskerming | ▲ | Plant Protection |
| Tuinbou | ▲ | Horticulture |
| Veerterenskunde | ▲ | Veterinary Science |
| Vee- en Suivelkunde | ▲ | Animal and Dairy Science |

STELLENBOSCH

NAVORSINGSINSTITUUT:
RESEARCH INSTITUTES:

- | | | |
|--------|---|-------------|
| Vrugte | ▲ | Fruit |
| Wynbou | ▲ | Viticulture |

PROEFPLAAS:
EXPERIMENTAL FARMS:

- | | | |
|-------------|---|---------------|
| Elzenburg | ○ | Helderfontein |
| Fleurbaix | ○ | Mariendal |
| Nietvoorbij | ○ | Welgevallen |

Horticultural Research Institute (Roodeplaat)
Private Bag X293, Pretoria, 0001

Director - Mr E. Strydom
Deputy Director - Dr J.T. Meynhardt
Assistant Director - Mr O.J. Olivier

The Institute is responsible for all applied and fundamental research and extension on vegetables, cut flowers, ornamental plants and shrubs throughout the whole of South Africa and on deciduous fruit and table grapes in the summer rainfall areas. The Institute controls research stations for vegetables, flowers, decorative plants, table grapes and deciduous fruit research at Roodeplaat in the Transvaal Middleveld and for cherry and deciduous fruit at Emperani, near Ficksburg. In Addition the Institute undertakes research on vegetables in the winter rainfall area at Elsenburg, Outeniqua and Lutzville, as well as at Glen in the Orange Free State, at Nelspruit in the Transvaal Lowveld, at Cedara in Natal and at Addo in the Eastern Cape. Research on indigenous flowers, mainly proteas, is undertaken at Elsenburg and at the Tygerhoek Research Station near Riviersonderend.

Veterinary Research Institute
Onderstepoort, 0110

Director - Dr K.E. Weiss
Deputy Directors: Drs R.B. Bigalke and T.W. Naudé
Assistant Directors:
(Professional Technical Auxiliary Services) - Dr B.J. Erasmus;
(Pathology) - Dr J.G. Pienaar;
(Parasitology and Propagation) - Dr C.J. Howell;
(Virus Diseases) - Dr D.W. Verwoerd;
(Bacterial and Protozoic Diseases) - Dr C.M. Cameron;
(Chemistry) - Dr R. Oellermann
(Vaccine Preparation) - Mr P.J. van Rooyen
(Special Grade Control Technician)

The Institute is concerned with research on diseases of stock and wild game (infectious and others, including diseases caused by malnutrition), diagnostics, the preparation of vaccines and diagnostic aids, and the biological evaluation of dips and remedies submitted for registration.

Animal and Dairy Science Research Institute
Private Bag X2, Irene, 1675

Director - Dr J.H. Hofmeyr
Deputy Director (Livestock Improvement, Animal Physiology and Nutrition and Poultry Science) - Dr P.E. Lombard (Assistant Director)
Deputy Director (Dairy Science) - Dr J.C. Oosthuizen
Assistant Directors:

(Livestock Improvement) - Mr J.S.A. Landrey;
(Animal Physiology and Nutrition) - Dr J.G. Cloete;
(Poultry Science) - Mr W.J.C. Viljoen;
(Dairy Science) - Dr J.H. Labuschagne

The Institute, at various centres throughout the country, undertakes at the natural level performance and progeny testing as well as fundamental research on the breeding, feeding and physiology of farm animals. The Institute is also responsible for dairy and poultry research on a country-wide basis as well as for the training of dairy technologists at Glen. The Institute has at its disposal a main research station at Irene, undertakes poultry research at Potchefstroom, Elsenburg, the University Experimental Farm at Pretoria and Cedara, and controls random testing of poultry at Irene and Glen as well as pig testing stations at Irene, Cedara and Elsenburg, and bull testing stations at Queenstown and Omatjenne (South West Africa).

Fruit and Fruit Technology Research Institute
Private Bag X5013, Stellenbosch, 7600

Director - Dr P.G. Marais
Deputy Director - Dr A.J. Heyns (Director)
Assistant Directors:

(Table Grapes, Horticulture, Plant Improvement, Plant Pathology and Entomology) - Dr A.C. Myburgh;
(Chemistry, Cold Storage, Plant Biochemistry, Fruit Processing, Radio Isotopes) - Dr W.J. Pienaar

The Institute is responsible for research on deciduous fruit, table grapes and certain aspects of proteas in the winter rainfall area, as well as for research at national level in connection with certain technological aspects of fruits and other agricultural products assigned to it. The Institute further renders a radiation and radio-isotopic service in connection with agricultural problems in the winter rainfall complex.

The Institute controls the research stations and experimental farms at Groot Drakenstein (Bien Donné), Citrusdal, De Doorns, Elgin, Langkloof, Paarl and Robertson.

Oenological and Viticultural Research Institute
Private Bag, Stellenbosch, 7600

Director - Dr J. de V. Burger
Deputy Director - Mr M.S. le Roux
Assistant Director - Dr J. Deist
Assistant Director - Dr P.J. Gous

The Institute is responsible for all research in the sphere of oenology and viticulture for the winter rainfall area, and all viticultural research in the Lower Orange River area. For this purpose the Institute has at its disposal research stations at Stellenbosch (Nietvoorbij) and Robertson, as well as experimental

vineyards at Upington and Lutzville. The Institute controls the historic wine farm Groot Constantia.

(c) DIVISIONS

Division of Soil Protection

Agriculture Building, Beatrix Street,
Private Bag X120, Pretoria, 0001

Director - Dr J. Serfontein

Deputy Director (Regulatory Control) - Mr H.S. Niehaus

Assistant Director (Land Subdivision and Weed Control) - Mr J.L. Vosloo

Assistant Director (Administrative) - Mr T. Brenkman

The Division is responsible for the administration of the Soil Conservation Act (Act no. 76 of 1969), the Weeds Act (Act no. 42 of 1937), and the Subdivision of Agricultural Land Act (Act no. 70 of 1970). The Division also administers the following assistance schemes in terms of the Soil Conservation Act: the Financial Assistance Scheme, Flood Assistance Scheme, Stock Reduction Scheme, Veld Reclamation Scheme and Grass Ley Scheme.

Division of Agricultural Engineering

Creswell Road, Koedoespoort, Private
Bag X515, Silverton, 0127

Director - Mr J.J. Bruwer

Chief Engineers: Dr B. van D. Boshoff
Mr C.T. Crosby

Assistant Chief Engineers;

(Soil Conservation Works (Aliwal North) -
Mr P.J. Pienaar

(Mechanisation: Plant Production) - Mr. J.
H. Eckard

(Mechanisation: Animal Production) - Mr J.
Veenstra

(Farming Development) - Mr C.J. van
Schalkwyk

(Winter Rainfall Complex (Stellenbosch)) -
Mr J.F. la G. Matthee

(Irrigation Engineering) - Mr I. Scheepers

(Soil Conservation Engineering) - Mr.
H.W.P.W. Struck

The Division has a specialised task and devotes itself to all engineering problems in the agricultural industry such as mechanisation, (farm power and machinery), soil conservation, water utilisation, farm structures, handling of material, storage of grain, cold storage and processing of fruit, vegetables and other assigned products, as well as all other engineering services with which the Department is concerned, such as the preparation and development of plots on irrigation schemes. In addition to providing construction, utility, expert extension, regulatory and testing services in the above connection, the Division also undertakes related research.

Division of Agricultural Information

Agriculture Building, Beatrix Street, Private
Bag X144, Pretoria, 0001

Director - Mr D.B. Marais

Assistant Director (Information Service) - Mr R.J.
van Niekerk, (Deputy Director)

Assistant Director (Publications and Visual
Services) - Mr Q. Momberg

The function of the Division is the distribution of agricultural information by mass media. For this purpose use is made of scientific and popular agricultural publications, radio programmes, audiovisual aids and press releases. The Division is also responsible for the maintenance of an agricultural information bureau.

Division of Plant and Seed Control

Agriculture Building, Hamilton Street, Private
Bag X179, Pretoria, 0001

Director - Mr J.F. van Wyk

Deputy Director - Mr D.C. Lourens

Assistant Director (Quality Control) - Mr A.J.
Cronje

Assistant Director (Inspection and Control
Services) - Mr L.J. Grobler

The functions of this Division include the protection of propagation material and the assurance of its quality. The Division administers the Seeds Act (No. 28 of 1961), the Plant Breeders' Rights Act (No. 22 of 1964) and the Agricultural Pests Act (No. 3 of 1973).

Division of Veterinary Services

Old Transvaal Agricultural Union Building, 281
Struben Street, Private Bag X138, Pretoria, 0001

Director - Dr J.P. van der Merwe

Deputy Directors:

(Regulatory Services) - Vacant

(Health Services) - Dr J.D. Coetzee (Pretoria)

(Veterinary Services - South West Africa) -
Dr J.M. Erasmus (Windhoek)

Assistant Directors:

(Major Disease Eradication Schemes) - Dr A.
van Heerden (Pretoria);

(Meat Hygiene and Related Matters) - Dr
A.E. Gillespie (State Veterinarian) (Pretoria);

(Animal Health, Non-notifiable Diseases, AI
Services, Diagnostic Services, Training,
Extension, Liaison and Publications) - Dr P.P.
Bosman;

(Import and Export Control, Border
Control, Bantu Veterinary Services and
Nagana Control) - Dr G.C. Dent (Pretoria);
(Highveld Region) - Dr W.M.H. Löwe
(Potchefstroom);

(Natal Region) - Dr W.H.B. Bühr
(Pietermaritzburg);

(Eastern Cape and Karoo Region) - Dr
C.W.A. Belonje (East London);

(Eastern Transvaal Region) - Dr L.R. Hurter
(Pietersburg);

(Transvaal Region) - Dr F.W.B. du Casse (Pretoria);
 (Free State Region) - Dr T.A.T. Louw (Bloemfontein);
 (Winter Rainfall Region) - Dr E.O. le Riche (Stellenbosch);
 (SWA North) - Dr C. van Jonker (Windhoek)
 (SWA South) - Dr C.J. Coetzee (Windhoek)
 Assistant Director (Administrative) - Mr F. Huisman

The Assistant Directors of the Regions are under the direct control of the Director.

The Division has a specific task in regard to animal health as laid down in the Animal Diseases and Parasites Act, 1956 (Act 13 of 1956) and regulations promulgated in terms thereof.

The Division guards against the introduction of diseases by erecting, patrolling and maintaining game- and cattle-proof fences on the borders of the Republic and South West Africa and by controlling animal imports. For domestic protection regular inspections of all stock are carried out. The promotion of animal health schemes to eradicate certain diseases and animal health in general enjoy high priority.

The Division also has four Regional Veterinary Laboratories throughout the Republic and South West Africa for local investigation of stock losses, problems relating to animal health and suboptimal production and reproduction.

In terms of the Animal Slaughter, Meat and Animal Products Hygiene Act, 1967 (Act 87 of 1967), the Division is responsible for the promotion and maintenance of hygiene in cattle slaughterings and handling of meat and animal products, for preventing the transmission of diseases to human beings and animals by disease-infected animals, meat or animal products, for preventing cruelty to animals slaughtered at abattoirs and for controlling the importation of meat.

(e) REGIONAL ORGANISATIONS

The eight Regional Organisations of the Republic, as well as of South West Africa, are responsible within their respective geographical areas, for the planning, development, promotion and application of farming systems based on optimal land utilisation.

Each of these organisations provides an extension service in which the soil conservation effort is integrated and which also covers every aspect of farming. The research services are directed to the collation and releasing of scientific knowledge for the optimal utilisation of the natural agricultural resources. The research personnel are also responsible for specialist extension work and for supplying training services to the agricultural colleges.

Highveld Region

Private Bag 804, Potchefstroom, 2520

Director - Dr J.D. Slabber

Deputy Director (Research) - Dr W.P. Grobbelaar

Assistant Director (Research) - Vacant

Deputy Director (Extension) - Dr F.J. Kok

Assistant Director (Extension) - Vacant

Grootfontein College of Agriculture

Research Stations and experimental farms:

Potchefstroom complex (central research station), Bethlehem and Swartrand (for gousiekte research) at Ventersdorp

Karoo Region

Grootfontein Agricultural College, Middelburg, 5900

Director - Dr W.J. Hugo

Deputy Director (Research) - Mr T.E. Skinner (Crops and Pastures Institute)

Assistant Director (Research) - Mr J.A.A. Baard

Deputy Director (Extension) - Mr C.R. Baard

Assistant Director (Extension) - Dr A.J. Siepker

Grootfontein College of Agriculture

Research stations experimental farms:
 Grootfontein, Middelburg, CP (central research station), Carnarvon, Tarka Conservation Area, Hales Flats and Jansenville

Natal Region

Private Bag 9021, Pietermaritzburg, 3200

Director - Dr P. Hildyard

Deputy Director (Research) - Mr J.D. Basson (Highveld Region)

Assistant Director (Research) - Dr J.W.C. Mostert

Deputy Director (Extension) - Mr R.H. Peard

Assistant Director (Extension) - Dr D.M. Scotney

Assistant Director (Administrative) - Mr D.E. Foster

Cedara College of Agriculture

Research stations experimental farms: Cedara (Central Research Institute), Drakensberg Complex, Northern Natal, Kokstad, Makatini, Pongolapoort and Ukulinga

Eastern Cape Region

P.O. Box 233, Queenstown, 5320

Director - Dr P.W. Roux

Deputy Director (Research) - Mr J.H. Stapelberg

Assistant Director (Research) - Mr J.L. van der Walt

Deputy Director (Extension) - Mr R.W. Nott (Head Office, Sub-directorate: Co-ordination of Agricultural Resources Development)

Assistant Director (Extension) - Dr E. le F. Terblanche

Research stations: Dohne (central research station) at Stutterheim, and Bathurst (Port Alfred). A number of experiments are also conducted at East London.

Transvaal Region

Agrivaal Building, cor. Edmund and Hamilton Streets, Private Bag X180, Pretoria, 0001

Director - Mr D.F. de Wet

Deputy Director (Research) - Dr J.J. du Toit
(Head Office, Sub-directorate: Co-ordination of Research Actions)

Assistant Director (Research) - Dr M.K.S.L. von Chevalerie

Deputy Director (Extension) - Mr S.J. Gericke
(Assistant Director)

Assistant Director (Extension) - Mr. W.H. de Vos
Assistant Director (Administrative) - Mr J.A. van Niekerk

Research stations experimental farms: Roodeplaat (central research station), Rietondale, Soutpan (Pretoria), Athole (Amsterdam), Loskop (Groblersdal), Mara (Louis Trichardt), Messina, Nooitgedacht (Ermelo) and Towoomba (Warm Baths).

Free State Region

Agricultural College, Glen, 9360

Director - Dr S.W. Pienaar

Deputy Director (Research) - Mr W.S. Grobbelaar

Assistant Director (Research) - Dr P.J. Niemann

Deputy Director (Extension) - Mr A.B. Bridgens
(Panel Professional Auxiliary Services)

Assistant Director (Extension) - Mr C.W. Oosthuizen

Assistant Director (Administrative) - Mr G.W. Long

Glen College of Agriculture

Research stations and experimental farms: Glen (central research station), Armoedsvlakte (Vryburg), Koopmansfontein (Barkly West), Rietrivier (Herbert), Sandvet, Sydenham, Upton Complex and Vaalharts (Jan Kempdorp)

Winter Rainfall Region

J.S. Marais Building, Private Bag X5023, Stellenbosch, 7600

Director - Dr J.E. Erasmus

Deputy Director (Research) - Dr P.J.S. Pieterse

Assistant Director (Research) - Mr J.E. van Niekerk

Deputy Director (Extension) - Mr A. Viljoen

Assistant Director (Extension) - Mr D.J. van Z. Smit

Assistant Director (Administrative) - Mr H.C. du Preez

Stellenbosch-Elsenburg College of Agriculture

Research stations and experimental farms: Elsenburg, Mariendal and Welgevallen (Stellenbosch), Langgewens (Moorreesburg), Nortier (Lambert's Bay), Oudtshoorn, Outeniqua (George), Tygerhoek (Riviersonderend) and the Veld Reserve at Worcester

South West Africa

Private Bag X13184, Windhoek, 9100

Director - Dr L. Mostert

Deputy Director (Research and Extension) - Mr J.H. Loubser

Assistant Director (Research) - Vacant

Assistant Director (Extension) - Mr C.H. de Klerk
Neudam College of Agriculture

Research stations experimental farms: Gellap 'Ost (Keetmanshoop), Hardap (Mariental), Kalahari (Stampriet), Neudam (Windhoek), Omatjenne (Otjivarongo), Sandveld (Gobabis), Sonop (Grootfontein) and Uitkomst (Grootfontein).

(2) ADVISORY PRODUCTION COMMITTEES

The following is a list of the various production committees operating in the Department. The committees consist of representatives of this Department, other interested Departments, organized agriculture, the control boards and the various branches of the agricultural industry.

They were constituted for the purpose of creating liaison between the above-mentioned bodies, to solve problems arising in the different agricultural industries and to promote production.

Most of these committees are reconstituted every three years.

A. PLANT PRODUCTION

1. ADVISORY COMMITTEE FOR COFFEE PRODUCTION

Department of Agricultural Technical Services
Dr J.H. Grobler (Chairman)
Mr R.H. Peard

Department of Agricultural Economics and Marketing
Mr J. de J. Jooste

Department of Bantu Administration and Development
Mr J.J. Lutz

Department of Commerce
Mr J. Jooste

Coffee Growers Association of South Africa
Dr G.H. Shuker
Mr P. Mayne
Mr E.W. Steward

South African Tea, Coffee and Chicory Association
Mr O.P. Kelly

2. ADVISORY COMMITTEE FOR PINEAPPLE PRODUCTION

Department of Agricultural Technical Services
Dr J.H. Grobler (Chairman)

Mr J.H. Stapelberg
Mr L. Ginsburg
Mr R.H. Peard

Perishable Products Export Control Board
Mr J.M. Bester

Fruit and Vegetable Canners Association
Mr J.R. Burg

3. ADVISORY COMMITTEE FOR CITRUS PRODUCTION

Department of Agricultural Technical Services
Dr J.H. Grobler (Chairman)
Dr I.H. Wiese
Mr A. van Oostrum
Mr J.H. Stapelberg
Mr S.J. Gericke
Mr L. Ginsburg

Citrus Board
Mr D.C. Lötter
Mr N.C. Lodewijks
Mr D. Raubenheimer
Dr D.A. Stanton
Mr M.B. Georgala
Mr G.F. Malan
Mr T.F.S. Malherbe
Mr H.J. van Baalen

South African Agricultural Union
Mr F. Meyer

Bantu Investment Corporation
Dr D. Bester

University of Pretoria
Dr L.C. Holtzhausen

Perishable Products Export Control Board
Mr J.M. Bester

4. ADVISORY COMMITTEE FOR DECIDUOUS FRUIT PRODUCTION

Department of Agricultural Technical Services
Dr P.G. Marais (Chairman)
Dr J. de V. Burger
Mr E. Strydom

Deciduous Fruit Board
Mr D.H. Moodie
Mr G.C. Burger
Mr P.E. Redelinghuys

South African Agricultural Union
Mr H.J. Ligthelm
Mr H.J. van Niekerk
Mr W.T. Steward
Mr J.E. Nel

Dried Fruit Board
Mr J.J.S. le Roux

S.A. Fruit and Vegetable Canners Association
Dr J.A. Mouton

Perishable Products Export Control Board
Mr J.M. Bester

Canning, Apricot and Peach Board
Mr B.J. Napier

Cape Pomological Association
Mr E.J. Rossouw

5. ADVISORY COMMITTEE FOR FOOD TECHNOLOGICAL MATTERS

Department of Agricultural Technical Services
Dr P.G. Marais (Chairman)
Dr J.H. Grobler
Dr B.H. Koepen

Department of Agricultural Economics and Marketing
Mr F.J. le Roux

Food Research Institute of the CSIR
Mr J.P. de Wit

S.A. Citrus Juice Manufacturers and Exporters Association
Mr J.M. Crewes

S.A. Fruit and Vegetable Canners Association
Mr C.L.N. Hansmann
Mr N.C. Goosen
Mr A. Laudon

Food Manufacturers
Mr E.R. Newbary

Deciduous Fruit Board
Mr F.J. Botha

Apricot and Peach Producers Association
Mr A.S. Fullard

Citrus Board
Dr D.A. Stanton

Dried Fruit Board
Mr J.J.S. le Roux

Department of Health
Dr P.N. Swanepoel

South African Agricultural Union
Mr J.R. Burg

6. ADVISORY COMMITTEE FOR WINE PRODUCTION

Department of Agricultural Technical Services
Dr J.D. Burger (Chairman)
Dr A.J. Heyns
Mr G.W. Oosthuizen
Mr J.J. Bruwer
Mr A.F. Kriel

KWV
Mr L.N. Jonker
Mr P.B.B. Hugo
Mr W.J. van Zyl
Mr W.S. Smit
Dr J.A. van Zyl

Cape Wine and Spirits Institute
Mr R.R. Melck
Mr H.M.E. Flockmann
Dr P.J. Venter

Dried Fruit Board
Mr J.J.S. le Roux

Stellenbosch Estate Wines (Coop.) Ltd.
Mr F.J. Malan

Cooperative Wine Cellars Committee
Mr J.S. Odendaal

Coordinating Committee of the Western
Cape Growers Association
Mr H.F. Smit

University of Stellenbosch
Prof. C.J. Orffer
Prof. C.J. van Wyk

Department of Agricultural Economics
and Marketing
Mr J.S.G. Joubert

7. ADVISORY COMMITTEE FOR TOBACCO PRODUCTION

Department of Agricultural Technical
Services
Mr J.F. Peens (Chairman)
Dr A.J. Pienaar

Central Cooperative Tobacco Company
of S.A. Ltd.
Mr H.G. Wenhold
Mr A.J. de Jager
Mr J.W. Louw
Mr J.A. Opperman
Mr J.D.R. Henstock
Dr W.P. Kolver

Tobacco Manufacturers Committee
Mr V.I. Breytenbach

Tobacco Board
Mr D.S. Schmidt

Appointed by the Minister of Agriculture
Dr F.W. van Zyl

8. ADVISORY COMMITTEE ON SMALL GRAIN

Department of Agricultural Technical
Services
Dr A.J. Pienaar (Chairman)
Dr J.D. Slabber
Dr J.E. Erasmus
Dr D.J. Rossouw

Department of Agricultural Economics
and Marketing
Mr J.S.G. Joubert

Wheat Board
Mr W.D. de Waal
Mr H.H. Klerck

South African Agricultural Union
Mr S.W. van der Merwe
Mr C.D. Cillie
Mr D. Rossouw
Mr S. Schoombee

S.A. Breweries
Mr G.C.L. Coe

National Chamber of Milling
Mr J.R.S. van Selm

National Federation of Master Bakers of S.A.
Col G.H. Boerstra

9. ADVISORY COMMITTEE FOR VEGETABLE OIL PRODUCTION

Department of Agricultural Technical Services
Dr A.J. Pienaar (Chairman)
Dr J.W. Snyman

S.A. Oil Pressers Association
Mr E.M. Benson

South African Agricultural Union
Mr D.J. Bosman
Mr L.C. Eksteen
Mr J.J. Wessels
Mr P.E. Grobler

Oil Seeds Control Board
Mr W.H. Liebenberg
Mr J.I. du Toit

S.A. Groundnut and Processors Association
Mr M. Edges

Feed Manufacturers Association
Dr J.A. van der Merwe

Department of Agricultural Economics
and Marketing
Mr H.S. Hattingh

10. ADVISORY COMMITTEE FOR BANANA PRODUCTION

Department of Agricultural Technical
Services
Dr J.H. Grobler (Chairman)
Mr S.J. Gericke

Department of Agricultural Economics
and Marketing
Mr D.C. van Zyl

South African Agricultural Union
Mr M. Tooley
Mr P.E.R. Redelinghuys

Banana Control Board
Col C.J. Huyzers
Mr J.R. Minnaar

11. ADVISORY COMMITTEE FOR DRY BEAN PRODUCTION

Department of Agricultural Technical
Services
Dr A.J. Pienaar (Chairman)

Dr J.W. Snyman
Dr W.P. Grobbelaar

Department of Agricultural Economics
and Marketing
Mr H.S. Hattingh

Department of Bantu Administration
and Development
Mr H.I. Riekert

South African Agricultural Union
Mr J.J.A. van Wyk
Mr P.W. Prinsloo
Mr J.J. Bezuidenhout

South African Fruit and Vegetable
Canners Association
Mr J.G. Campbell

Dry Bean Control Board
Mr L.B. Rothman
Mr S.F. Papenfus

Food Research Institute of the CSIR
Mr J.P. de Wit

12. ADVISORY COMMITTEE FOR POTATO PRODUCTION

Department of Agricultural Technical
Services

Mr D.F. de Wet (Chairman)
Mr F.I. du Plooy
Mr D.C. Lourens
Dr J.E. van der Plank
Dr W.P. Grobbelaar

South African Agricultural Union
Mr M.F. Crick
Mr H.J. Pieterse

Potato Board
Mr L.P. Carney
Mr P.L. Steyn

Seed Potato Producers Union
Mr T. Cook
Mr S.J. van Rensburg

Department of Agricultural Economics
and Marketing
Mr J.S.G. Joubert

13. ADVISORY COMMITTEE FOR MAIZE AND GRAINSORGHUM PRODUCTION

Department of Agricultural Technical
Services

Dr A.J. Pienaar (Chairman)
Dr J.D. Slabber
Dr W.P. Grobbelaar

Department of Agricultural Economics
and Marketing
Mr S.W. van der Merwe

Department of Bantu Administration
and Development
Mr J.J. Lutz

Maize Board
Mr B.H. Wilkens

South African Agricultural Union
Mr A.J. Nel
Mr M. Daling

S.A. Fertilizer Association
Dr P.C. Möhr

S.A. Hybrid Maize Seed Organisation
Mr B.J. Vorster

B. ANIMAL PRODUCTION

1. ADVISORY COMMITTEE FOR THE PRODUCTION OF WOOL

Department of Agricultural Technical
Services

Dr J.H. Hofmeyr (Chairman)
Dr W.J. Hugo
Dr P.R. Mansvelt

Department of Agricultural Economics
and Marketing
Mr H.S. Hattingh

Department of Bantu Administration
and Development
Mr W.F. Waugh

Wool Board
Mr G.A. Aggenbach
Mr A. Paul

S.A. Wool and Textile Research Institute
Dr D.P. Veldsman

Merino Stud Breeders Association of S.A.
Mr O.J.M. van den Heever

S.A. Wool and Mohair Brokers Association
Mr N.J. Vlok

S.A. Wool and Mohair Buyers Federation
Comdt R.D.L. Davis

National Wool Growers Association
Mr P.W. van Rooyen
Mr H.F. Prinsloo

2. ADVISORY COMMITTEE FOR SHEEP PERFORMANCE AND FLEECE- TESTING SERVICES

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)

S.A. Stud Book Association
Mr A.R.D. Halse
Mr Dodds Pringle

Meat Board
Mr A.M. Wessels

Merino Stud Breeders Association of S.A.
Mr O.J.M. van den Heever

Wool Board
Mr H.F. Prinsloo

3. ADVISORY COMMITTEE FOR KARAKUL SHEEP PRODUCTION

Department of Agricultural Technical
Services

Dr J.H. Hofmeyr (Chairman)

Dr L. Mostert

Dr L.J.F. von Maltitz

Mr D.A. Boshoff

Department of Agricultural Economics
and Marketing

Mr C.D. Kruger

Karakul Board

Dr H.J. van Hase

Karakul Breeders Association of S.A.

Mr J.J. Bouwer

South West African Agricultural Union

Mr W. Barnard

Mr M.O. Baartman

4. ADVISORY COMMITTEE FOR MOHAIR PRODUCTION

Department of Agricultural Technical Services

Dr J.H. Hofmeyr (Chairman)

Dr W.J. Hugo

Dr P.R. Mansvelt

Department of Agricultural Economics
and Marketing

Mr H.S. Hattingh

S.A. Wool Textile Research Institute

Dr D.P. Veldsman

S.A. Mohair Producers Association

Mr J.F. Froehlich

Angora Stud Breeders Association of South Africa

Mr J.D.D. Kettlewell

Mohair Board

Mr H.H. Coetzer

Mr D.A. Hobson

5. ADVISORY COMMITTEE FOR BEEF, MUTTON AND GOAT MEAT

Department of Agricultural Technical Services

Dr J.H. Hofmeyr (Chairman)

Dr P.R. Mansvelt

Dr L. Mostert

Department of Agricultural Economics
and Marketing

Mr H.S. Hattingh

Meat Board

Mr G.H. Gluckman

Mr S.J.J. van Rensburg

Mr R.J. Theunissen

Mr P.J. Pretorius

Dr J.H. Lombard

Mr A.P. Pretorius

Department of Bantu Administration
and Development

Mr W.F. Waugh

South African Agricultural Union

Mr P.R. du Toit

Mr J.P. Smit

Mr F.P. Möller

Dr J.S. Starke

6. ADVISORY COMMITTEE FOR DAIRY BULL TESTING

Department of Agricultural Technical Services

Dr J.H. Hofmeyr (Chairman)

Mr J.S.A. Landrey

Friesland Cattle Breeders Society
of South Africa

Mr T.E.M. Murray

Ayrshire Cattle Breeders Association
of South Africa

Mr J.M. Walker

S.A. Guernsey Cattle Breeders Society

Mr D.C. Hart

Jersey Cattle Breeders Society

Mr H.M. de Villiers

Artificial Insemination Co-operatives

Dr C.T. McDonald

Central Milk Recording Co-operative

Mr P.L. Barnard

7. ADVISORY COMMITTEE FOR THE NATIONAL BEEF CATTLE PERFORMANCE AND PROGENY TESTING SCHEME

Department of Agricultural Technical Services

Dr J.H. Hofmeyr (Chairman)

Dr P.R. Mansvelt

South African Agricultural Union

Mr P.R. du Toit

Meat Board

Mr S.J.J. van Rensburg

Mr A.P. Pretorius

Mr A.E. Hambly

Mr J.F. Vercueil

South African Stud Book Association

Mr R.J. Theunissen

Mr A.R.D. Halse

8. ADVISORY COMMITTEE FOR MILK RECORDING

Department of Agricultural Technical Services

Dr J.H. Hofmeyr (Chairman)

Mr J.S.A. Landrey

Milk Recording Cooperatives

Mr P.L. Barnard

Mr D. Houston

Mr G.B. Newcombe

S.A. Stud Book Association (Milk Breeds)
Mr T.E.M. Murray

Artificial Insemination Cooperations
Dr C.T. McDonald

Milk Board
Mr F.G. Bekker

Dairy Board
Mr J.J.M. van Vuuren

S.A. Agricultural Union
Mr E.H. Nolte

9. ADVISORY COMMITTEE FOR DAIRY PRODUCTION AND TECHNOLOGY

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Dr J.C. Oosthuizen

Department of Agricultural Economics and Marketing
Mr J.P. van der Walt

S.A. Agricultural Union
Mr C.J. Newcombe
Mr J.J.M.J. van Vuuren

Dairy Products Manufacturers Association
Mr L. Stein
Dr M.N. Hermann

Milk Distributors Association
Mr T.C. Rijs

Dairy Board
Mr P.J.H. Maree

Milk Board
Mr A.C. Visser

S.A. Dairy Technology Association
Mr P.H. Lishman

10. ADVISORY COMMITTEE FOR PIG MEAT PRODUCTION

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Dr P.R. Mansvelt

Department of Agricultural Economics and Marketing
Mr J. de J. Jooste

S.A. Pig Development Association
Mr S. Saffer
Dr W.A. Vosloo

Meat Board
Mr G.H. Braak
Mr P.J. Pretorius

S.A. Pig Breeders Society
Mr A. Webber

S.A. Agricultural Union
Mr J.B. Haasbroek

11. ADVISORY COMMITTEE FOR PIG TESTING

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Dr P.P. Bosman

S.A. Pig Breeders Society
Mr R.N. Barnes

Meat Board
Mr G.M. Braak

Pig Industry Committee
Mnr. S. Saffer

12. ADVISORY COMMITTEE FOR POULTRY PRODUCTION

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Dr P.R. Mansvelt

Department of Agricultural Economics and Marketing
Mr C.D. Kruger

Egg Board
Mr D. Jacobs

S.A. Poultry Association
Mr P.J. Serfontein
Mr S.C. Methven

S.A. Agricultural Union
Mr A.E. Karlsen

13. ADVISORY COMMITTEE FOR RANDOMISED EGG-LAYING AND BROILER TESTS

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Mr W.C.J. Viljoen
Dr J.M. Erasmus

S.A. Poultry Association
Mr M. Oosthuizen
Mr T. Saunders
Mr A.L. McCarthy
Mr J. Mervish
Dr G. Faber

S.A. Agricultural Union
Mr D. Finlayson

14. ADVISORY COMMITTEE ON THE ANIMAL SLAUGHTER, MEAT AND ANIMAL PRODUCTS HYGIENE ACT, (ACT 87 OF 1967) AND ITS APPLICATION

Department of Agricultural Technical Services
Dr P.R. Mansvelt (Chairman)
Dr J. Coetzee
Mr C.S. de Villiers

Department of Agricultural Economics and Marketing
Mr J.P. van der Walt

Department of Health
Dr J.G. Oberholster

Meat Board
Dr F.J. van Biljon
Mr G.H. Braak
Mr G.N. Gluckman
Mr S.J.J. van Rensburg
Mr G.J.K. Marais (Acting)

United Municipal Management of South Africa
Dr C.R. Mackenzie

S.A. Veterinary Society
Dr M.M. Greathead

Abattoir Commission
Prof. L.W. van den Heever

(3) STATUTORY BOARDS

1. VETERINARY BOARD

Department of Agricultural Technical Services
Dr B.C. Jansen (Chairman)

University of Pretoria
Prof. C.F.B. Hofmeyr

S.A. Veterinary Society
Prof. L.W. van den Heever
Dr R.I. Coubrough
Dr B.C. Wessels

Department of Justice
Mr M.J. Prins

2. ARTIFICIAL INSEMINATION BOARD

Department of Agricultural Technical Services
Dr J.H. Hofmeyr (Chairman)
Dr P.R. Mansvelt
Mr C.J. Wessels
Dr G.B. Laurence
Dr P.B. Winterbach
Dr E. Krog

S.A. Studbook Society
Mr A.L. Doidge
Mr T.E.M. Murray
Mr R.J. Theunissen
Mr A.R.D. Halse
Mr H.M. de Villiers

Artificial Insemination Centres
Dr A.B. la Grange
Dr C.T. MacDonald

S.A. Society for Animal Production
Dr J.H. Lombard

S.A. Veterinary Society
Dr A.P. Schutte

S.A. Agricultural Union
Mr S.H.J. Brits
Mr P.L. Barnard
Mr B. MacLaghlan
Capt A. Sol
Mr W.C. Malan, M.P.

(4) OTHER ADVISORY COMMITTEES

1. ADVISORY COMMITTEE FOR THE TESTING OF AGRICULTURAL ENGINEERING EQUIPMENT

Department of Agricultural Technical Services
Mr J.J. Bruwer (Chairman)
Mr C.T. Crosby

Department of Agricultural Economics and Marketing
Mr C.D. Kruger

S.A. Agricultural Union
Mr C.F. Vosloo

S.A. Agricultural and Irrigation Machinery Manufacturers Association
Mr L. Lee

S.A. Institute of Agricultural Engineers
Prof. P.J.C. Vorster

National Agricultural Machinery Traders Association
Mr A. von Eckardstein

CSIR
Mr E.R. Leeman

S.A. Bureau of Standards
Mr P. Scribante

University of Natal
Mr P. Meiring

University of Pretoria
Prof. B.J.G.W. Grobler

2. ADVISORY COMMITTEE FOR THE TRAINING OF PROSPECTIVE FARMERS

Department of Agricultural Technical Services
Dr D.J. Agenbach (Chairman)
Dr J.E. Erasmus
Dr J.D. Slabber
Dr S.W. Pienaar
Dr W.J. Hugo
Dr D.M. Joubert
Dr L. Mostert
Dr P. Hildyard

S.A. Agricultural Union
Mr A.J. Basson
Mr J. Wilkens

Department of National Education
Mr J.H. Swiegers

Department of Agricultural Economics and Marketing
Mr J.K. Siertsema

3. ADVISORY COMMITTEE FOR BOTANICAL RESEARCH

Department of Agricultural Technical Services
Dr B. de Winter (Chairman)
Dr D.J.B. Killick
Dr D. Edwards

Department of Forestry
Dr H.A. Lückhoff

National Botanic Gardens of S.A.
Prof. H.B. Rycroft

National Parks Board of Trustees
Mr P. van Wyk

Interprovincial Nature Conservation Committee
Mr P. le Roux

S.A. Association of Botanists
Prof. O.A. Lewis
Prof. H.M. van der Schijff
Prof. C.F. Cresswell
Prof. N. Grobbelaar
Prof. E.A. Schelpe
Prof. M.C. Papendorf

4. SOIL PROTECTION ADVISORY BOARD

Department of Agricultural Technical Services
Dr D.J. Agenbach (Chairman)
Dr J. Serfontein

Representatives of Regional Advisory Committees
Mr T.F. Dreyer
Mr J.A. Jooste
Mr H.P. van der Walt
Mr P.E. van Papendorp
Mr T.N. van Lill
Mr J.C. Grobler
Mr J.J. du Plessis
Mr M.G. Reynolds

S.A. Agricultural Union
Mr H.P. van der Walt

Nominated by the Minister of Agriculture
Mr W.C. van den Heever

5. TECHNICAL LIAISON COMMITTEE FOR THE PRODUCTION OF TEA

Department of Agricultural Technical Services
Dr J.H. Grobler (Chairman)

Department of Bantu Administration
and Development
Mr J.J. Lutz

Tea Producers
Mr D.J. Pennwill
Dr P.P. du T. Deetlefs

6. SELECTION COMMITTEE FOR THE IMPORT OF DECIDUOUS FRUIT CULTIVARS

Department of Agricultural Technical Services
Dr P.G. Marais (Chairman)
Mr J.N. Horn
Mr H.P. van Heerden
Mr D.J. Engelbrecht
Dr J.T. Meynhardt

Canning Fruit Board
Mr A.S. von M. Fullard

University of Stellenbosch
Prof. D.K. Strydom

Cape Pomological Society
Mr J.E. Mudge

Dried Fruit Board
Mr S.C. Rautenbach

Deciduous Fruit Board
Mr G.W. Larmuth

Deciduous Fruit Plant Improvement Scheme
Mr G.C. Burger

S.A. Nurserymen's Association
Mr H.P. du Preez

7. ADVISORY COMMITTEE REGARDING RESEARCH GRANTS BY THE DEPARTMENT OF AGRICULTURAL TECHNICAL SERVICES TO UNIVERSITIES

Department of Agricultural Technical Services
Dr J.C. Strydom (Chairman)
Dr B.C. Jansen
Prof. S.A. Hulme

University of Pretoria
Prof. C.F.B. Hofmeyr
Prof. D.J.J. Potgieter

University of Stellenbosch
Prof. H.A. Louw

University of the Orange Free State
Prof. G.D.B. de Villiers

University of Natal
Prof. K. Nathanson

Office of the Scientific Adviser
to the Prime Minister
Dr S.J.P.K. van Heerden

(6) SCIENTIFIC PAPERS PUBLISHED BY OFFICERS OF THE DEPARTMENT: JULY 1975 TO JUNE 1976

Agricultural chemistry

DU PLESSIS, H.N. & HUTSON, J.L., 1975.
Feasibility of effluent disposal by means of
irrigation. Symposium on recycling of waste
water for agricultural and industrial uses.
Herzliya-on-sea, Israel, 24-26 Nov. 1975.

(3) FINANCES
(a) REVENUE (REPUBLIC)
1975/76

	R	R	R
1. Rental from houses			166 064,06
2. Interest			43 713,38
3. Recoveries of loans			
4. Departmental receipts			
<i>Administration and General</i>			
Registration fee	136 653,25	136 653,25	
Vaccines		1 858 295,80	
Goods and services		2 776 751,58	
Publications		42 635,85	
5. Miscellaneous revenue			
(a) Refund on voted expenditure	124 575,89		
(b) Sale of State Property	62 746,48		
(c) Unclaimed cash	8 592,54		
(d) Miscellaneous	350 447,30	546 332,21	5 360 668,69
TOTAL			5 570 446,13
6. Interest on Tobacco Research Account			19 505,32
7. Interest on Wine Research Account			2 022,71
8. Interest on Agricultural Research Account			5 780,29
TOTAL REVENUE			5 597 754,45

(b) REVENUE (SWA)
1975/76

	R	R	R
1. Rental from houses			3 420,28
2. Departmental receipts			131 687,01
Vaccines			—
Goods and services			—
Publications			—
3. Miscellaneous revenue			—
TOTAL REVENUE			135 107,29

JACKSON, D.C., 1976. Proposed mineral leaf analysis standards for vegetables in the Republic of South Africa. 1. Tomatoes. *Agroplantae* 8, 19-20.

JACKSON, D.C., 1976. Proposed mineral leaf analysis standards for vegetables in the Republic of South Africa. 11. Sweet Potatoes. *Agroplantae* 8, 21-22.

TERBLANCHE, J.H., DE WAAL, DORIS, PIENAAR, W.J., GURGEN, K.H., DEMPERS, P.J., 1976. New standards for leaf composition in apples. *Decid. Fruit grow.* 26, 76-79.

Agro-climatology

GARLIPP, G.W.E.A., 1976. The influence of rainfall on maize grain yield. *Agroplantae* 8, pp 21-22.

GREEN, G.C. & KUHNE, F.A., 1975. Estimating the state of maturation of a banana bunch from meteorological and supporting data. *Agrochemophysica* 7, 27-32.

KARSTEN, J.H.M., DEIST, J. & DE WAAL, H.O., 1975. A method of predicting the

calibration curve for a neutron moisture meter. *Agrochemophysica* 7, 49-54.

VERSTER, E., 1975. Paleosols in die Naboomspruit omgewing. Handeling 6de Kongres Grondkundever. van SA: 317-323.

Agricultural engineering

(All test reports published by Dept. agric. tech. Serv. Pretoria)

BEHR, W., PRETORIUS, J., Meganisasie as integrale deel van boerderybeplanning.

BOSHOF, B. VAN D., HEYNS, A.J., FISCHER, J.W., 1976. Test report No. 7601: Gandy granular herbicide applicator.

BOSHOF, B. VAN D., HEYNS, A.J., FISCHER, J.W., 1976. Test report No. 7602: John Deere 1240 granular herbicide applicator.

BOSHOF, B. VAN D., HEYNS, A.J., FISCHER, J.W., 1976. Test report No. 7603: John Deere 7000 granular herbicide applicator.

BOSHOF, B. VAN D., HEYNS, A.J., FISCHER, J.W., 1976. Test report No. 7604:

(c) EXPENDITURE (REPUBLIC)

1975/76

	Vote	Expenditure
	R	R
Salaries and allowances	30 524 000	30 605 477,79
Subsistence and transport	3 911 000	3 970 666,38
Postal services	467 000	640 192,30
Printing	760 000	810 595,88
Miscellaneous	1 150 000	1 089 414,94
Plant Protection	282 000	321 934,00
Animal and Dairy Science	780 000	841 518,21
Tobacco	52 000	58 007,05
Soil and Irrigation	145 000	184 170,78
Horticulture	73 000	64 490,04
Citrus and Subtropical Fruit	233 000	232 138,98
Fruit and Fruit Technology	132 000	122 954,63
Botany	65 000	78 764,08
Oenology and Viticulture	172 000	162 602,87
Veterinary	912 000	1 225 860,64
Veterinary Field Services	1 506 000	1 764 160,19
Plant Pest Control	930 000	1 158 828,58
Agricultural Information	147 000	127 370,95
Agricultural Engineering	885 000	977 481,73
Plant and Seed Control	35 000	41 479,39
General maintenance cost (Regions)	838 000	842 049,39
Soil conservation	12 296 000	10 917 929,04
Agricultural Research Stations	656 000	706 880,97
Agricultural Scholarship, etc.	771 000	753 759,74
Minor works	278 000	281 095,39
TOTAL EXPENDITURE	58 000 000	57 979 893,94

(d) EXPENDITURE (SWA)

1975/76

	Vote	Expenditure
	R	R
Salaries and allowances	1 939 000	1 915 814,64
Subsistence and transport	667 000	712 895,16
Postal services	22 000	27 819,04
Printing	17 000	16 307,93
Miscellaneous	23 000	23 458,12
Agriculture	167 000	33 642,20
Veterinary	353 000	254 712,81
Soil conservation	3 627 000	3 688 089,56
Agricultural Experiment Farms	218 000	200 739,59
Minor works	1 000	—
TOTAL EXPENDITURE	7 034 000	6 873 479,05

(4) BUILDINGS

- (a) *Major constructions completed*
Irene: Animal and Dairy Science R 1 050 000
Research Institute:
Administration Building
- (b) *Major constructions in hand*
Onderstepoort: Veterinary R 400 000
Research Institute: Workshop R 420 000
Ermelo: Nooitgedacht
Agricultural Research Station:
Research building
Onderstepoort: Veterinary R 555 000
Research Institute: Isolation
stables for virus section

Massey-Ferguson
applicator.

granular

herbicide

CARTER-BROWN, D.H., 1975. Test report No.
7511: John Deere 23B tool bar.

- CARTER-BROWN, D.H., 1975. Test report No. 7512: Big Ox five tine ripper-subsoiler.
- CARTER-BROWN, D.H., 1975. Test report No. 7513: Bosveld five tine ripper-subsoiler model 5 CS.
- CARTER-BROWN, D.H., 1975. Test report No. 7514: Tiger three tine ripper-subsoiler.
- CARTER-BROWN, D.H., 1975. Test Report No. 7515: Two tine ripper-subsoiler.
- CARTER-BROWN, D.H., 1975. Test report No. 7516: Bosveld three tine ripper model 38.
- CARTER-BROWN, D.H., 1975. Test report No. 7517: Landman five tine ripper.
- CARTER-BROWN, D.H., 1975. Test report No. 7518: Safim S12 ripper. pp.2.
- CARTER-BROWN, D.H., 1975. Test report No. 7519: Vibra ripper-chisel plough.
- CARTER-BROWN, D.H., 1975. Test report No. 7520: John Deere 98 tool carrier with coil shank attachments chisel plough.
- CARTER-BROWN, D.H., 1975. Test report No. 7521: Soilmaster seven tine chisel plough.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test Report No. 7661: Albert vertical batch mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7662: Albert vertical batch mixer trailed type.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7663: Hippo vertical batch mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7664: Krog vertical batch mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7665: Tornado vertical batch mixer model 2000.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7666: Tornado vertical batch mixer model 3000.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7667: Eknim inclined screw mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7668: Nauta inclined screw mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7669: Rotomenger drum mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7670: Ernest H Johnson's horizontal slow paddle mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7671: Gehl auger wagon mixer.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7672: Gehl grinder-mixer combination model 95.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7673: Gehl grinder-mixer combination model 120.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7674: Sperry New Holland grinder-mixer combination.
- DE SZABO, J., HORVATH, J.A., ANDREWS, C.R., 1976. Test report No. 7675: Drotsky continuous high-speed mixer.
- DE SZABO, J., The practical design of cyclone dust collectors for agricultural hammermills.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7501: Nobili 300 tractor mounted vineyard spraying machine.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7502: Nobili 500 tractor mounted vineyard spraying machine.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7503: Dahlia Southrade trailed pressure sprayer with Nobili S 125 pump and holder two section nozzle booms.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7504: Tecnomat tractor-mounted vineyard spraying machine.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7505: Aidco tractor mounted vineyard sprayer.
- DE WEERDT, S.J.P., HUGO, F.J.C., STANDER, H.C., CONRADIE, W.F., 1975. Test report No. 7506: FMC Bean TM 1229 tractor mounted sprayer.
- GEERTSEMA, F. DE K., 1976. Test report No. 7643: Rain Bird 20-TNT (Aluminium arm), 4 pp.
- GEERTSEMA, F. DE K., 1976: Test report No. 7644: Rain Bird 20A-TNT (Bronze arm). 4 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7645: Rain Bird 20L-TNT, 3 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7646: Rain Bird 29B-TNT, 3 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7647: Rain Bird 30-TNT & 30W-TNT, 4 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7648: Rain Bird 30B-TNT & 30BW-TNT, 4 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7649: Rain Bird 30E-TNT & 30EW-TNT, 4 pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7650: Rain Bird 30LA-TNT, 3pp.
- GEERTSEMA, F. DE K., 1976. Test report No. 7651: Rain Bird 40B-TNT & 40BW-TNT.
- GEERTSEMA, F. DE K. 1976. Test report No. 7652: Rain Bird 14070-TNT & 14070W-TNT.
- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7531: Viking tive SVA mower.
- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7532: International harvester 4-13.
- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7533: Aktiv TH mower.

- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7534: New Holland 445E mower.
- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7535: John Deere 39 N mower.
- GROVE, J.S., ADKINS, P.R., NORTH, R.P., MILLER, D.J., 1975. Test report No. 7536: Massey Ferguson 32-7 mower.
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- (7) LEAFLET SERIES**
- FIELD CROPS**
- Cotton**
- A.3 Extent of cotton-growing in South Africa - Van der Merwe, J.J. and Clarke, P.F.
- B.2 Growth pattern and life cycle of the cotton plant - Van Heerden, H.G.
- C.1 *Omgewingsbehoefes van die katoenplant* - Theron, C.G.
- C.3 Areas where cotton can be cultivated - Ehlers, J.H. and Van Heerden H.G.
- D.1 Cultivar recommendations on cotton cultivation - Theron, C.G.
- D.2 *Beskrywing van katoencultivars en hulle aanpassing* - Theron, C.G.
- Groundnuts**
- D.1 Groundnut seed - Snyman, J.W.
- H.2 Lifting of groundnuts - Landsberg, J.P.H.
- H.3 The raking of windrows during the harvesting of groundnuts - Landsberg, J.P.H.
- H.4 The harvesting of groundnut pods - Landsberg, J.P.H.
- Guar**
- No. 137 Guar - a crop with a future in South Africa - Institute for Crops and Pastures
- Maize**
- A.1 Historical origin of maize (*Zea mays* L.) - Nel, P.C.
- C.1.1 *Groei- en ontwikkelingsstadia van die groeiende mielieplant* Nel, P.C. and Smit, N.S.H.
- C.1.2 *Groei- en ontwikkelingsstadia van die volwasse mielieplant* Nel, P.C. and Smit, N.S.H.
- C.3.3 Soil characteristics and production - Möhr, P.J.
- F.2.1 Planning of a fertilisation programme - Möhr, P.J.
- Potatoes**
- G.2 Foliage defects: Virus diseases - Roodeplaat Research Station
- G.4 Foliage defects: Fungal diseases - Roodeplaat Research Station
- G.5 Foliage defects: Physiological diseases - Roodeplaat Research Station
- G.9 Tuber defects: Virus diseases - Roodeplaat Research Station
- G.10 Tuber defects: Bacterial diseases - Roodeplaat Research Station

- G.11 Tuber defects: Fungal diseases - Roodeplaat Research Station
- G.12 Tuber defects: Physiological diseases - Roodeplaat Research Station
- G.14 Tuber defects: Nutgrass ("Uintjies") - Roodeplaat Research Station
- H.3 *Opberging van tafelaartappels* - Du Plooy, F.I. en Greyling, B.C.

Wheat cultivation under irrigation

- D.1 Cultivar recommendations for wheat under irrigation - Van der Mey, J.A.M.
- F.1 Wheat quality - National Wheat Work Team

Wheat cultivation in the Summer Rainfall Area

- E.2 *Verbouingspraktyke op die Springbokvlakte* - Van der Merwe, J.J. and Van der Mey, J.A.M.
- F.1 Wheat quality - National Wheat Work Team
- G.2 *Plantplaagbeheer op die Springbokvlakte* - Van der Merwe, J.J. and Van der Mey, J.A.M.

Wheat cultivation in the Winter Rainfall Area

- D.1 Wheat cultivars for the Western Cape and southern coastal areas - Wicht, J.E. and Maree, P.C.J.

Artificial Pastures and Forage Crops

- No. 139 Kikuyu (*Pennisetum clandestinum*) - Roos, J.H.

DECIDUOUS FRUIT

Apples

- F.5 Physiological cold storage disorders of apples - Visagie, T.R.
- G.4 Apple scab - Schwabe, W.F.S. and Matthee, F.N.
- G.8 Scale insects - Swart, P.L., Barnes, B.N. and Pringle, K.L.
- G.11 Root rot of apple trees - Matthee, F.N. and Hugo, H.J.
- H.2 Harvesting and handling of apples - Eksteen, G.J. and Ginsburg, L.
- I.2 Apple juice - Nortje, B.K. and Du Toit Hugo, J.F.
- I.4 Canned apple products - Nortje, B.K. and Theron, J.C.D.

Stone fruit

- C.3 Thinning of stone fruits - Stadler, J.D.
- D.1 Weed control and cover crops - Hanekom, A.N.
- E.1 Stone fruit: The scheduling of irrigation - Van Rooyen, F.C.
- F.1 Delayed foliation of stone fruit - Blommaert, K.L.J.
- G.6 Powdery mildew of stone fruits - Van der Spuy, J.E. and Matthee, F.N.
- G.7 Crown gall of stone fruits - Van der Spuy, J.E. and Matthee, F.N.

- G.8 Bacterial blackspot of stone fruits - Thomas, A.C. and Matthee, F.N.
- G.9 Leaf curl in peaches - Matthee, F.N.
- G.10 Gumspot or *Coryneum* blight of stone fruits - Schwabe, W.F.S. and Matthee, F.N.
- G.11 Blossom blight and brown rot of stone fruits - Schwabe, W.F.S. and Matthee, F.N.
- G.12 *Eutypa* - Die-back in apricots - Matthee, F.N. and Thomas, A.C.
- G.13 Brown rust of stone fruit - Matthee, F.N. and Hugo, H.J.
- I.2 Canning - Nortje, B.K., Van Rhyn, J.A.G. and Hansmann, C.F.
- I.3 Drying of stone fruits - Du Toit Hugo, J.F. and Wium, G.L.
- I.4 Fruit nectars - Hansmann, C.F. and Nortje, B.K.
- I.5 Jams and other products - Nortje, B.K. and Potgieter, Alma

CITRUS FRUIT

- A.1 History and origin of citrus - Eshuys, W.A.
- B.1 Climatic requirements of citrus - Green, G.C., Bozalek, S.J. and Schoeman, A.S.
- B.2 Wind protection for citrus orchards - Green, G.C., Bozalek, S.J. and Schoeman, A.S.
- B.3 Climatic data for important citrus production areas - Green, G.C. and Bozalek, S.J.
- B.4 Soil requirements - Du Plessis, S.F.
- D.4 The lay-out of citrus orchards - Burger, W.P. and Conradie, J.
- G.1 Orchard cultivation - Bredell, G.S. and Barnard, C.J.
- G.5 Nucellar embryony in citrus - De Lange, J.H.
- G.6 Pollination requirements of citrus - De Lange, J.H.
- H.1.1.1 Citrus black spot - Brodrick, H.T. and Wood, R.
- H.1.1.1(a) Light and temperature effects on symptom development of citrus black spot disease - Brodrick, H.T.
- H.1.1.1(b) Influence of pruning citrus trees on the efficacy of control of black spot (*Guignardia citricarpa* Kiely) - Loest, F.C. and Van Oostrum, A.
- H.1.1.1(c) Accentuation of blemish marks by copper fungicide sprays - Brodrick, H.T.
- H.1.1.3 *Cercosporiosis* - Brodrick, H.T.
- H.1.2.1 Damping-off - Brodrick, H.T.
- H.1.3 Storage diseases - Brodrick, H.T.
- H.1.3.1 Green mould - Brodrick, H.T.
- H.1.3.2 Blue contact mould - Brodrick, H.T.
- H.1.3.3 Sour rot - Brodrick, H.T.
- H.1.3.4 *Trichoderma* brown rot - Brodrick, H.T.
- H.1.3.5 *Diplodia* stem-end rot - Brodrick, H.T.
- H.1.3.6 *Alternaria* rot - Brodrick, H.T.
- H.2.1 Citrus cancer - Brodrick, H.T. and Loest, F.C.
- H.4 Non-pathogenic abnormalities and other diseases - Brodrick, H.T., Loest, F.C. and Frean, R.T.
- H.4.1 Sooty mould - Brodrick, H.T., Frean, R.T. and Loest, F.C.

- H.4.2 Sooty blotch - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.3 Felt - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.4 Mistletoe - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.5 Dodder or *Cuscuta* - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.6 Lichens on citrus trees - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.7 Gum spot of leaves - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.9 *Decortiosis* or shell bark - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.10 Endoexerosis or internal decline of the lemon - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.11 Lightning injury - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.12 Mesophyll collapse of leaves - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.4.13 Stylar-end rot of Tahitian limes - Brodrick, H.T., Frean, R.T. and Loest, F.C.
- H.12 "Lowveld citrus mite" (*Eutetranychus annekei* Meyer) - Schwartz, A.
- H.15 Locusts and grasshoppers on citrus - Bedford, E.C.G.
- H.16 Termites as citrus pest - Coaton, W.G.H.

SUBTROPICAL FRUIT AND NUTS

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- H.6 The rapid and accurate determination of alcohol, total SO₂ and total sugar contents in wines - Du Plessis, C.W.
- H.7 Harvesting stage of Steen grapes in the Stellenbosch area - Du Plessis, C.S.
- H.8 Browning of white wines - The influence of seeds, stems, skins, cultivar and temperature - Du Plessis, C.S.
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- H.10 The total titratable acidity of wine grapes as quality factor: White cultivars - Du Plessis, C.S.
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- C.2 Cauliflower cultivars - Coertze, A.F. and Olivier, O.J.

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- C.1 Tomato cultivars for the Transvaal Lowveld - Oosthuizen, A.S.A. and Bosch, S.E.
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- A.11 Ornamental vines - Ankiewicz, A.T.

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- B.5 *Maatstawwe van seleksie* - Bosman, D.J.

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- B.1 Breeding principles - Nel, J.E.
- B.4 Flock selection I: Breeding objectives and selection procedure - Steyn, O.P.J.
- B.5 Flock selection II: Selection techniques and standards - Steyn, O.P.J.
- D.3.1 Drought feeding of Merinos - Steenkamp, C.W.P. and Hayward, F.C.
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- D.3.3 Utilisation of drought-resistant fodder crops - Steenkamp, C.W.P. and Hayward, F.C.
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- D.7 Gestation - Swart, D.W.
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(9) NEW LEGISLATION 1975/76

Plant Breeders' Rights Act, 1976 (Act 15 of 1976); substitutes Plant Breeders' Rights Act, 1964 (Act 22 of 1964).

Plant Improvement Act, 1976 (Act 53 of 1976); substitutes Seeds Act, 1961 (Act 28 of 1961), Foundation Seed Act, 1961 (Act 29 of 1961) and Agricultural Pests Act, 1973 (Act 3 of 1973) (only partially).

Wine, Other Fermented Beverages and Spirits Amendment Act, 1976 (Act 68 of 1976); amends Wine, Other Fermented Beverages and Spirits Act, 1957 (Act 25 of 1957).

